

FortiOS™ Handbook - System Administration

VERSION 5.4.6



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FortiOS™ Handbook - System Administration

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Change Log

Date	Change Description
01/11/2018	Update to 'FortiOS 5.4.2'.
08/08/2017	Corrected CLI commands in Obfuscate HTTP responses
03/24/2017	Added content on licensing isolated FortiGates
02/23/2017	Added CLI commands for HTTPS redirect .
01/12/2017	Made correction to links and CLI in Central Management
11/8/2016	Mantis bug 395055 - correction to SNMP content
10/17/2016	Edits throughout document and deletion of information that is covered in Networking chapter.
09/06/2016	Update to 5.4.1 and restructure table of contents. Correct encryption method for L2TP VPNs.

Introduction

Welcome and thank you for selecting Fortinet products for your network protection.

This guide explains how to get started with a FortiGate unit, as well as examining basic configuration tasks, best practices, and more advanced configuration options.

How this guide is organized

This guide contains the following sections:

[What's New in FortiOS 5.4](#) informs you about new system features in FortiOS 5.4.x.

[Administrators](#) describes the tasks that can be done to add and secure administrative access to a FortiGate.

[Central management](#) describes how to configure the FortiGate unit to use FortiManager as a method of maintaining the device and other features that FortiManager has to facilitate the administration of multiple devices.

[Monitoring](#) discusses the various methods of monitoring both the FortiGate unit and the network traffic through a range of different tools available within FortiOS.

[Replacement messages](#) explains how to view and customize various replacement messages on the FortiGate.

[Administration for schools](#) shares basic practices administrators in school systems can employ to meet the challenges of maintaining a network and access to the Internet

[PPTP and L2TP](#) contains information on configuring PPTP and L2TP VPNs as well as PPTP passthrough.

[Session helpers](#) explains how to use session helpers to analyze the data in the packet bodies of some protocols and adjust the firewall to allow those protocols to send packets through the firewall.

[Advanced concepts](#) describes more involved administrative topics to enhance network security and traffic efficiency.

What's New in FortiOS 5.4

This section describes new system administration features added to FortiOS 5.4.0, FortiOS 5.4.1, and FortiOS 5.4.2.

FortiOS 5.4.2

Incorrect access group for backup and restore config (389328)

FortiOS no longer allows lower level administrator profiles to backup and restore the FortiOS configuration (because this would allow them to acquire hashes for administrator passwords, including super-admin).

Enhancements to IPS Signatures page (285543)

The IPS signatures list page now shows which IPS package is currently deployed. Users can also change their IPS package by linking directly to the FortiGate's **System > FortiGuard** page from the IPS Signatures list page.

Combine multiple commands into a CLI alias (308921)

Multiple commands can be supported under a single command alias defined in the CLI by users.

Configure alias command

```
config system alias
  edit "alias-name" -- Alias command name
    set command "get system status" -- Command list to execute
  next
end
```

Basic config examples (simple command substitution)

```
config sys alias
  edit 1
    set alias "sh ver"
    set cmd "get system status"
  next
  edit 2
    set alias "sh ip route"
    set cmd "get router info routing-table all"
  next
  edit 3
    set alias "sh bgp sum"
    set cmd "get router info bgp summary"
  next
  edit 11
    set alias "debug1"
    set cmd "diag debug enable;diag debug flow show console enable"
  next
  edit 12
```

```

        set alias "debug2"
        set cmd "diag debug flow filter saddr"
        set noenter enable
    next
    edit 13
        set alias "debug3"
        set cmd "diag debug flow trace start"
        set noenter enable
    next
    edit 14
        set "alias debugstop"
        set "cmd diag debug flow trace stop"
    next
end

```

Advanced config examples (parameter substitution)

```

config sys alias
    edit 4
        set alias "sniff (\d+\.\d+\.\d+\.\d+)"
        set cmd "diag sniffer packet any 'host $1' 4"
    next
    edit 5
        set alias "sniff6 (\d+\.\d+\.\d+\.\d+)"
        set cmd "diag sniffer packet any 'host $1' 6"
    next
    edit 6
        set alias "sniff (\S+) (.*)"
        set cmd "diag sniffer packet $1 '$2' 4"
    next
    edit 7
        set alias "trace (\d+\.\d+\.\d+\.\d+) (\d+)"
        set cmd "diag debug enable;diag debug flow show console enable;diag debug flow
            filter saddr $1;diag debug flow trace start $2"
    next
end

```



The `noenter` setting specifies whether the alias substitution should contain a new line or not.

These examples are placed in numerical order.

New SNMP trap for bypass events (307329)

When bypass mode is enabled or disabled on FortiGate units that are equipped with bypass interfaces and support AMC modules, a new SNMP trap is generated and logs bypass events.

FortiOS 5.4.1

Maintainer password recovery enhancements (356944)

For information about recovering a lost password and enhancements to the process, see: [Resetting a lost Admin password](#) on the Fortinet Cookbook site.

SSH support updated to 7.1p1 (290889)

The OpenSSH daemon has been upgraded from version 3.7.1p2 to version 7.1p1 to support new security algorithms.

The central management FortiGuard server list can include FQDNs (354449)

This new feature implements support of FQDN, to make it an option for central-management server-list. This feature can be set through the GUI and the CLI.

GUI Changes

On **System > FortiGuard > Override FortiGuard Servers > Create New / Edit**, a new option, **FQDN** is added for **Address Type**.

CLI Changes

```
config server-list
edit 1
    set server-type {update|rating}
    set addr-type {ipv4|ipv6|fqdn} <== added fqdn
    set server-address ipv4
    set server-address6 ipv6
    set fqdn FQDN <== added
end
```

Features removed from the FortiGate 80C (356154)

Features have been changed on the FortiGate / FortiWifi 80C so as to increase available memory and decrease the image size on flash.

Changes made include:

- removal of web application firewall (WAF)
- removal of WAN optimization
- removal of network vulnerability scan (netscan)
- compression of the Intrusion Prevention System and AntiVirus library files and storing them in a gzip file
- compression of certain WiFi data files
- addition of virtual switch function for 80c (applicable to 5.4 only)

FortiOS 5.4.0

New role property on interfaces (294385)

Interfaces now have a property called 'role' which affects visibility and suggests different default options depending on its value.

- WAN - this interface is used to connect to the internet.
- LAN - this interface is used to connect to local network of endpoints.
- DMZ - this interface is used to connect to servers.
- Undefined - This interface has a custom role which isn't one of the above.

Interface roles affect visibility of properties and features (295736)

Depending on an interface's role, some properties may be set to a default value and the visibility of others may be set to show or hide in the GUI.

Toggle automatic authorization of extension devices (294966)

When an interface is configured to be dedicated to an extension device, a new option appears to auto-authorize extension devices.

Support for new modem added (293598)

Support for the Linktop LW273 modem has been added.

IPS packet capture files can be backed up (276489)

Use the command `execute backup disk ipsarchives` and the option of `tftp`, `ftp`, or `usb`.

Change between NAT and Transparent modes removed from the GUI (278289)

The feature in the GUI initiating the change between NAT and Transparent modes has been removed. It can still be done, but only through the CLI. The configuration setting that is used is:

```
config system settings
  set opmode [nat | transparent]
end
```

Switch mode changes (286447)

Hub mode is no longer available. The old switch mode, usually called 'LAN' will no longer be available. The interface mode is still available and on all models, and instead of the old switch mode, most of the lower end units will come configured, by default, with a hardware switch called 'LAN', which has the function of the old switch mode but is more flexible. Most models with 40 ports or more will come by default in vlan switch mode.

New start attribute as been added to scheduled scripts (285206)

The start attribute has the options manual and auto. Manual means a schedule script needs to be manually started after a reboot. Auto automatically restarts the script after a reboot.

Use the following command to set a script to automatically run after the FortiGate starts up:

```
config system auto-script
  edit <script-name>
    set start auto
  end
```

Toggle displaying the hostname on the GUI login page (272572)

Use the following command:

```
config sys settings
  set gui-display-hostname {disable | enable}
end
```

PPTP and L2TP address pool ranges expanded (275709)

PPTP and L2TP address pool ranges are allowed to use a subnet mask of up to 255.255.0.0 (B-class), increasing the maximum range size from 254 to 65,534

Pop up notification of impending timeout of Administrator GUI sessions (266413)

A convenience feature to let administrators know that their session is about to expire. This is especially convenient for units that have a timeout setting of just a few minutes.

SNMP can generate traps based on detecting a device's online/offline status (273107)

This setting is related to the device detection feature. It allows SNMP traps to detect when a new device comes online. Within SNMP configurations there is a configurable timeout setting that periodically checks for the device. When a check determines that the device is present a trap is sent.

In the GUI, when configuring an SNMP object, one of the settings is a checkbox, under **SNMP Events** for **Device detected**.

To configure the SNMP object in the CLI use the following syntax:

```
config system snmp community
  edit <community ID number>
    set name <string>
    set events device-new
  end
```

In order to configure the idle timeout for the device, use the following syntax in the CLI:

```
config system global
  set device-idle-timeout <integer of time in seconds>
end
```

The time value for the field can be set from 30 to 31536000.

SNMP improvements for dynamic routing (168927)

SNMP improvements for dynamic routing include support for RFC 4750 OSPF Version 2 Management Information Base and RFC 5643 Management Information Base for OSPFv3. These changes add the capability of logging dynamic routing activity. Examples include sending OSPF routing events or changes to a syslog server or FortiAnalyzer or changes in neighborhood status.

Network Mobility Extensions for Mobile IPv4 (NEMO)

This is an implementation of RFC 5177 that includes the following CLI command.

```
config system mobile-tunnel
    set status enable/disable //Enable/disable this mobile tunnel.
    set roaming-interface port1 //Roaming interface name.
    set home-agent xxx.xxx.xxx.xxx //IP address of the NEMO HA.
    set home-address xxx.xxx.xxx.xxx // Home IP address.
    set n-mhae-spi 256 //NEMO authentication spi.
    set n-mhae-key-type ascii/base64 //NEMO authentication key type.
    set n-mhae-key vWZZxx //NEMO authentication key.
    set hash-algorithm hmac-md5 //Hash Algorithm.
    set tunnel-mode gre //NEMO tunnel mode.
    set renew-interval 60 //Time before lifetime expiration to send NEMO HA re-registration.
    set lifetime 180 //NEMO HA registration request lifetime.
    set reg-interval 5 //NEMO HA registration interval.
    set reg-retry 3 //NEMO HA registration maximal retries.
end
```

Restoring configuration file without rebooting the FortiGate (237786)

A setting has been added in the CLI that when set to enable, will allow the FortiGate to start using the newly uploaded configuration file without going through a full reboot process.

The syntax for the setting is:

```
config system global
    set reboot-upon-config-restore {enable | disable}
end
```

Auto repeat of CLI commands(160023 259531)

Occasionally there is a need to repeatedly run a diagnose command over a long period of time (like checking CPU or memory usage, or checking proxy health), Previously, this could only be done with external console connections. Now this can be done in a script using the `interval` and `repeat` commands.

Scripts can be uploaded as a file from the CLI or GUI. To upload scripts from the GUI go to **System > Advanced > Configuration Scripts** and upload and run the script.

To configure the schedule and scripts, use the following syntax:

```
config system auto-script
    edit <ScriptName>
        set interval
        set repeat
        set script
```

```
end
end
interval the interval time in seconds between instances of the script running.

repeat the number of times to repeat the running of the script. The value 0 is used to set an infinite number of repetitions.

start select manual to start the script manually or auto to start the script automatically

script the contents of the script.
```

This feature may not be available on all models as a hard drive is necessary to make use of it.

Proxy-arp function extension (250651)

A new attribute `end-ip` is added to `proxy-arp`. If `end-ip` is not set, then the `ip` has the same meaning as before. If `end-ip` is set, then the `ip` becomes the `start-ip`, and the `end-ip` should be larger than `ip` and the `ip` range should be less than 256.

```
config system proxy-arp
edit 1
set interface internal
set ip xxx.xxx.xxx.xxx
set end-ip xxx.xxx.xxx.xxx
next
end
```

Changes to the FortiGuard Distribution Network GUI page (219862)

The **System > FortiGuard** page has been updated to include new FortiGuard features including Mobile Malware Definitions, Botnet Definitions and so on. From this page you can also upload packages, and view the list of Botnet Definitions.


FortiGuard Distribution Network

License Information


Contract	Status	
FortiCare Support	✓ Registered (kleroux@fortinet.com)	Launch Portal
Hardware Version	✓ 8 x 5 support (Expires on 2016-09-29)	
Comprehensive Support	✓ 24 x 7 support (Expires on 2016-09-29)	
Firmware	✓ 8 x 5 support (Expires on 2016-09-29)	
Enhanced Support	✓ 24 x 7 support (Expires on 2016-09-29)	
IPS & Application Control	✓ Licensed (Expires on 2016-09-29)	+ Upload Package
IPS Definitions	⦿ Version 6.00755	
IPS Engine	⦿ Version 3.00156	
AntiVirus	✓ Licensed (Expires on 2016-09-29)	+ Upload Package
AV Definitions	⦿ Version 31.00354	
AV Engine	⦿ Version 5.00227	
Mobile Malware Definitions	⦿ Version 0.00000	
Botnet Definitions	⦿ Version 2.00684	View List
SSL-VPN Package	⦿ Unreachable	+ Upload Package
Web Filtering	✓ Licensed (Expires on 2016-09-29)	
Anti-Spam Filtering	✓ Licensed (Expires on 2016-09-29)	

From this page you can also access new functionality for AntiVirus and IPS updates and Web Filtering and Spam filtering.


AntiVirus & IPS Updates

Accept push updates  ☐


Scheduled Updates ☒ Every Hours

Improve IPS quality  ☐

Use extended IPS signature package ☒


 Update AV & IPS Definitions

Filtering

Web Filter Cache ☒ Clear cache after Minutes
 Clear Web Filter Cache

Anti-Spam Cache ☒ Clear cache after Minutes

FortiGuard Filtering Port 8888

Filtering Services Availability ☒ Available  Check Again

[Request re-evaluation of a URL's category](#)

You can also use this page to override FortiGuard servers.

Override FortiGuard Servers

Server Address	Server Type
Fall back to public FortiGuard servers	Enable

Changes to firmware upgrade GUI page (248866)

The following changes have been made to the GUI as it relates to the firmware upgrade process:

- The interface now provides an upgrade recommendations that is based on FortiGuard's list of supported upgrade paths
- Allows user to easily select and upgrade to one of the recommended versions
- There is a graphic representation of the progress of downloading the image and the upgrade process.

GUI features can now be enabled and disabled per VDOM (263708 273799)

When VDOMs are enabled, most of the items in the Features section of the menu are moved to a similar menu section within the VDOM menu and are now customizable on a per VDOM basis. Some items such as IPv6 and Certificates are still configured on a global basis.

From the GUI, you can enable or disable GUI features from **System > Feature Select**.

Feature Select

Basic Features	Security Features	Additional Features
<div>Advanced Routing</div> <div>IPv6</div> <div>Switch Controller <i>Disabled via CLI</i></div> <div>VPN</div> <div>WAN Opt. & Cache</div> <div>WiFi Controller</div>	Feature Set: Custom ▼ <div>Anti-Spam Filter</div> <div>AntiVirus</div> <div>Application Control</div> <div>CASI</div> <div>DLP</div> <div>DNS Filter</div> <div>Endpoint Control</div> <div>Explicit Proxy</div> <div>Intrusion Protection</div> <div>Web Application Firewall</div> <div>Web Filter</div>	<div>Allow Unnamed Policies</div> <div>Certificates</div> <div>DNS Database</div> <div>Domain & IP Reputation</div> <div>DoS Policy</div> <div>Email Collection</div> <div>FortiExtender <i>Disabled via CLI</i></div> <div>ICAP</div> <div>Implicit Firewall Policies</div> <div>Load Balance</div> <div>Local In Policy</div> <div>Local Reports</div>

From the CLI, GUI items that are enabled or disabled per-VDOM are configured from the `config system settings` command. GUI items that are enabled globally are enabled or disabled from the `config system global` command.



Turning these features on or off does not enable or disable the feature but determines whether or not that option is displayed on the GUI.

Improvements to system admin GUI pages (205280)



Several items relating to system administration, and the configuration of the system administrator accounts and profiles in particular, have been updated so that the layout is clearer and more efficient. One of the things improve is that it is now easier to set up two factor authentication.

New Administrator

User Name	<input type="text" value="New-admin"/>
Password	<input type="password" value="••••••••"/>
Confirm Password	<input type="password" value="••••••••"/>
Comments	<input type="text" value="Write a comment..."/> 0/255

Type

Local User

- Match a user on a remote server group 
- Match all users in a remote server group 

Administrator Profile

Security

☒ Two-factor Authentication

FortiToken:	<input type="text" value="FTKMOB5919B483DA"/>
Activation Email address <input checked="" type="checkbox"/>	<input type="text" value="new-admin@fortinet.com"/>
Activation SMS number <input type="checkbox"/>	



An email with the activation code will be sent to:
new-admin@fortinet.com

☐ Restrict login to trusted hosts

☐ Restrict admin to guest account provisioning only

The TFTP session helper supports (263127)

The TFTP session helper supports TFTP for NAT66 and NAT46.

Support for IPv6 addressing when configuring central management (297144)

Previously, the configuration of an IP address for a server for ratings and updates, such as a FortiManager, could only use IPv4 addresses. Now, as shown below IPv6 addressing can be used as well.

```
config system central-management
  set type fortimanager
  set fmg "2000:172:16:200::207"
  set vdom "vdom1"
  config server-list
    edit 1
      set server-type rating update
      set addr-type ipv6
      set server-address6 2000:172:16:200::207
    next
  end
end
```

New execute traceroute command options (272169)

Different query options can be configured for the `execute traceroute` command. These settings can also be saved using the `execute traceroute-options` command as follows:

```
execute traceroute-options device [Auto | <interface name>]
execute traceroute-options queries <integer>
execute traceroute-options source [Auto | <source interface IP address>]
```

The `queries` setting is to determine the number of queries per hop. Use `execute traceroute-options` to view the traceroute settings:

```
execute traceroute-options view-settings
Traceroute Options:
  Number of probes per hop: 3
  Source Address: auto
  Device: auto
```

Administrator password updates (292858)

To set a minimum level of security for the administrative accounts, minimum levels of complexity can be set on guest admin accounts.

```
config system password-policy-guest-admin
  set status [enable | disable]
  set min-lower-case-letter <integer>
  set min-upper-case-letter <integer>
  set min-non-alphanumeric <integer>
  set min-number <integer>
end
```

If the required level of complexity is not met, an error message will appear explaining that the password must conform to the system password policy.

Certificate validation added to FortiGate email server configuration (299506)

When configuring the email server on a FortiGate to send out alert emails that use SMTPS, the FortiGate can validate the email chain, thus reducing the possibility of compromise.

In the CLI the configuration of the email is set up with the following syntax:

```
config system email-server
  set type custom
  set reply-to <email address>
  set server <SMTP server IP address or hostname>
  set port <integer for SMTP server port>
  set source-ip <SMTP server source address - IPv4 format>
  set source-ip6 <SMTP server source address - IPv6 format>
  set authenticate [enable| disable]
  set validate-server [enable| disable]
  security Connection security.
  set security [none | starttls | smtps|
end
```

The `set validate-server` option is the new setting that enables the verification.

Changes to backing up and restoring configuration files (298176)

When you insert a USB drive into a FortiGate USB port options to save the configuration to USB and restore configuration from a USB appear on the configuration save and restore pages.

You can also use the command `execute backup usb` command to backup the configuration to the USB drive.

Administrators

By default, the FortiGate has a super administrator account, called `admin`, which cannot be deleted. Additional administrators can be added for various functions, each with a unique user name, password, and set of access privileges.

The following tasks can be done to add and secure administrative access to a FortiGate:

- [Administrator profiles](#)
- [Adding a local administrator](#)
- [LDAP authentication for administrators](#)
- [Other methods of authentication](#)
- [Monitoring administrators](#)
- [Management access](#)
- [Security precautions](#)

Administrator profiles

Administrator profiles define what the administrator can do when logged into the FortiGate. When you set up an administrator account, you also assign an administrator profile dictating what the administrator will see.

Depending on the nature of the administrator's work, access level or seniority, you can allow them to view and configure as much, or as little, as required.

super_admin profile

This profile has access to all components of FortiOS, including the ability to add and remove other system administrators. For some administrative functions, such as backing up and restoring the configuration, `super_admin` access is required. The `super_admin` profile cannot be deleted or modified, to ensure that there is always a method to administer the FortiGate.



Lower level administrator profiles cannot backup or restore the FortiOS configuration.

The `super_admin` profile is used by the default `admin` account. It is recommended to add a password and rename this account once you have set up your FortiGate. In order to rename the default account, a second admin account is required. For more information, see ["Administrators" on page 24](#).

Creating profiles

To configure administrator profiles go to **System > Admin Profiles** and select **Create New**.

On the **New Administrator Profile** page, you define the components of FortiOS that will be available to view and/or edit. For example, you can configure a profile so that the administrator can only access the **Firewall Configuration**, which includes firewall policies, addresses, services, schedules, packet capture, and some other parts of the FortiGate configuration. Any other aspects of the FortiGate configuration, including VPNs and security profiles, will be hidden from this administrator.

Adding a local administrator

Only administrators with read-write for **Administrator Users** can create a new administrator account.

To add an administrator - GUI

1. Go to **System > Administrators**.
2. Select **Create New**.
3. Add a **Name** for the administrator.



The name of the administrator should not contain the characters `<>()#''`. Using these characters in the administrator account name can result in a cross site scripting (XSS) vulnerability.

4. Enter the **Password** for the user. This may be a temporary password that the administrator can change later. Passwords can be up to 256 characters in length. For more information on passwords, see the [Passwords](#) discussion in the Getting Started chapter.
5. Set **Type** to **Local User**.
6. Set the **Administrator Profile** and **Security**
7. Select **OK**.

To add an administrator - CLI

```
config system admin
  edit <admin_name>
    set password <password>
    set accprofile <profile_name>
  end
```

LDAP authentication for administrators

Administrators can use remote authentication, such as LDAP, to connect to the FortiGate.

To do this, requires three steps:

- configure the LDAP server
- add the LDAP server to a user group
- configure the administrator account

Configure the LDAP server

First set up the LDAP server as you normally would, and include a group to bind to.

To configure the LDAP server - GUI

1. Go to **User & Device > LDAP Servers** and select **Create New**.
2. Enter a **Name** for the server.
3. Enter the **Server IP** address or name.

4. Enter the **Common Name Identifier** and **Distinguished Name**.
5. Set the **Bind Type** to **Regular** and enter the **User DN** and **Password**.
6. Select **OK**.

To configure the LDAP server - CLI

```
config user ldap
  edit <ldap_server_name>
    set server <server_ip>
    set cnid cn
    set dn DC=XYZ,DC=COM
    set type regular
    set user name CN=Administrator,CN=Users,DC=XYZ,DC=COM
    set password <password>
    set member-attr <group_binding>
  end
```

Add the LDAP server to a user group

Next, create a user group that will include the LDAP server that was created above.

To create a user group - GUI

1. Go to **User & Device > User Groups** and select **Create New**.
2. Enter a **Name** for the group.
3. In the section labeled **Remote groups**, select **Create New**.
4. Select the **Remote Server** from the drop-down list.
5. Select **OK**.

To create a user group - CLI

```
config user group
  edit <group_name>
    config match
      edit 1
        set server-name <LDAP_server>
        set group-name <group_name>
      end
    end
  end
```

Configure the administrator account

Now you can create a new administrator, where rather than entering a password, you will use the new user group and the wildcard option for authentication.

To create an administrator - GUI

1. Go to **System > Administrators** and select **Create New**.
2. In the **Administrator** field, enter the name for the administrator.
3. For **Type**, select **Match a user on a remote server group**.
4. Select the **User Group** created above from the drop-down list.
5. Select **Wildcard**. The Wildcard option allows for LDAP users to connect as this administrator.

6. Select an **Admin Profile**.

7. Select **OK**.

To create an administrator - CLI

```
config system admin
  edit <admin_name>
    set remote-auth enable
    set accprofile super_admin
    set wild card enable
    set remote-group ldap
  end
```

Other methods of authentication

Admin accounts can use a variety of methods for authentication, including RADIUS, TACACS+, and PKI.

RADIUS authentication for administrators

If you want to use a RADIUS server to authenticate administrators, you must:

- configure the FortiGate to access the RADIUS server
- create the RADIUS user group
- configure an administrator to authenticate with a RADIUS server.

TACACS+ authentication for administrators

If you want to use a TACACS+ server to authenticate administrators, you must:

- configure the FortiGate to access the TACACS+ server
- create a TACACS+ user group
- configure an administrator to authenticate with a TACACS+ server.

PKI certificate authentication for administrators

To use PKI authentication for an administrator, you must:

- configure a PKI user
- create a PKI user group
- configure an administrator to authenticate with a PKI certificate.

Monitoring administrators

You can view the administrators logged in using the **System Information** widget on the Dashboard. The **Current Administrator** row that shows the administrator logged in and the total number of administrators logged in. Selecting **Details** displays the administrators, where they are logging in from and how (CLI, GUI) and when they logged in.

You are also able to monitor the activities the administrators perform on the FortiGate using the event logging. Event logs include a number of options to track configuration changes.

To set logging - GUI

1. Go to **Log & Report > Log Settings**.
2. Under **Event Logging**, select **Customize** and ensure **System activity event** is selected.
3. Select **Apply**.

To set logging - CLI

```
config log eventfilter
    set event enable
    set system enable
end
```

To view the logs go to **Log & Report > System Events**.

Management access

Management access defines how administrators are able to log on to the FortiGate. In NAT mode, access is configured for each of the FortiGate's interfaces, using the interface's IP to connect. In Transparent mode, a single management IP address is configured to allow access.

Management access can be via HTTP, HTTPS, Telnet, or SSH sessions. HTTPS and SSH are preferred as they are more secure. The management computer must connect to an interface that permits management access and its IP address must be on the same network. If you are using VDOMs, an administrator who is restricted to a specific VDOM must use a computer that connects to an interface on that VDOM.

You can allow remote administration of the FortiGate; however, it is not recommended, since it could compromise the security of the FortiGate. If you require remote administration, the following precautions can be taken to improve the security of a FortiGate:

- Use secure administrator passwords.
- Change these passwords regularly.
- Enable two-factor authentication for administrators.
- Enable secure administrative access to this interface using only HTTPS or SSH.
- Use Trusted Hosts to limit where the remote access can originate from.
- Do not change the system idle timeout from the default value of 5 minutes.

Security precautions

One potential point of a security breach is at the management computer. Administrators who leave their workstations for a prolonged amount of time while staying logged into the GUI or CLI leave the firewall open to malicious intent.

Preventing unwanted log in attempts

Setting trusted hosts for an administrator limits what computers an administrator can log in from, causing the FortiGate to only accept the administrator's log in from the configured IP address. Any attempt to log in with the same credentials from any other IP address will be dropped.

Trusted hosts are configured when adding a new administrator by going to **System > Administrators** in the GUI or `config system admin` in the CLI.

To ensure the administrator has access from different locations, you can enter up to ten IP addresses, though ideally this should be kept to a minimum. For higher security, use an IP address with a net mask of 255.255.255.255, and enter an IP address (non-zero) in each of the three default trusted host fields. Also ensure all entries contain actual IP addresses, not the default 0.0.0.0.

The trusted hosts apply to the GUI, ping, SNMP, and the CLI when accessed through Telnet or SSH. CLI access through the console port is not affected.

Prevent concurrent administrator sessions

Concurrent administrator sessions occur when multiple people concurrently access the FortiGate using the same administrator account. This is allowed by default. If you wish to prevent this behavior, use the following CLI command:

```
config system global
    set admin-concurrent disable
end
```

Note, if you disable concurrent sessions for an administrator, you will be allowed only one session with the same username even if it is from the same IP.

On 2U FortiGates, this option is also available in the GUI by going to **System > Settings** and disable **Allow multiple concurrent sessions for each administrator**.

Segregated administrative roles

To minimize the effect of an administrator causing errors to the FortiGate configuration and possibly jeopardizing the network, create individual administrative roles where none of the administrators have super_admin permissions. For example, one account is used solely to create security policies, another for users and groups, another for VPN, and so on.

SSH log in time out

You can take up to 120 seconds to log into the FortiGate when using SSH. You can use the following CLI command to reduce this time to enhance security:

```
config system global
    set admin-ssh-grace-time <number_of_seconds>
end
```

The range can be between 10 and 3600 seconds.

HTTPS redirect

You can redirect an administrator's traffic from HTTP to HTTPS for a more secure connection.

To redirect HTTP to HTTPS - GUI

1. Go to **System > Settings**.
2. Under **Administration Settings**, enable **Redirect to HTTPS**.
3. Select **Apply**.

To redirect HTTP to HTTPS - CLI

```
config system global
```

```
set admin-https-redirect enable
end
```

This command is not available on low-crypto FortiGates. The default is `disable`.

Log in/out warning message

For administrators logging in and out of the FortiGate, you can include a log in disclaimer. This disclaimer provides a statement that must be accepted or declined where corporations are governed by strict usage policies for forensics and legal reasons.

This disclaimer can appear either before the log in screen loads (`pre-login banner`) or after an administrator enters their credentials (`post-login-banner`). The disclaimer is enabled through the CLI:

```
config system global
    set pre-login-banner enable
    set post-login-banner enable
end
```

The banner is a default message that you can customize by going to **System > Replacement Messages**. Select **Extended View** to see the **Administrator** category and messages.

Disable the console interface

You can disable your FortiGate's console interface to prevent any unwanted login attempts:

```
config system console
    set login disable
end
```

Disable other interfaces

If any of the interfaces on the FortiGate are not being used, disable traffic on that interface. This avoids someone plugging in network cables and potentially causing network bypass or loop issues.

To disable an interface - GUI

1. Go to **Network > Interfaces**.
2. Select the interface from the list and select **Edit**.
3. For **Administrative Access**, select **Down**.
4. Select **OK**.

To disable an interface - CLI

```
config system interface
    edit <interface_name>
        set status down
    end
```

Central management

Administering one or two FortiGate units is fairly simple enough, especially when they are in the same room or building. However, if you are administering many FortiGate units that may be located in locations in a large geographical area, or in the world, you will need a more efficient method of maintaining firmware upgrades, configuration changes, and updates.

The FortiManager family of appliances supply the tools needed to effectively manage any size Fortinet security infrastructure, from a few devices to thousands of appliances. FortiManager appliances provide centralized policy-based provisioning, configuration, and update management, as well as end-to-end network monitoring for added control. Managers can control administrative access and simplify policy deployment using role-based administration to define user privileges for specific management domains and functions by aggregating collections of Fortinet appliances and agents into independent management domains. By locally hosting security content updates for managed devices and agents, FortiManager appliances minimize web filtering rating request response time and maximize network protection.

This chapter describes the basics of using FortiManager as an administration tool for multiple FortiGate units. It describes the basics of setting up a FortiGate unit in FortiManager and some key management features you can use within FortiManager to manage the FortiGate unit. For full details and instructions on FortiManager, see the FortiManager Administration Guide.

This section includes the topics:

[Adding a FortiGate to FortiManager](#)

[Configuration updates through FortiManager](#)

[FortiGuard](#)

[Firmware updates](#)

[Administrative domains](#)

[Backup and restore configurations](#)



In order for the FortiGate unit and FortiManager unit to properly connect, both units must have compatible firmware. To find out if your firmware is compatible, refer to the FortiManager Release Notes or the [FortiManager support table for FortiOS](#).

Adding a FortiGate to FortiManager

Before you can maintain a FortiGate unit using a FortiManager unit, you need to add it to the FortiManager. This requires configuration on both the FortiGate and FortiManager. This section describes the basics to configure management using a FortiManager device. For more information on the interaction of FortiManager with the FortiGate unit, see the FortiManager documentation.

FortiGate configuration

These steps ensure that the FortiGate unit will be able to receive updated antivirus and IPS updates and allow remote management through the FortiManager system or FortiCloud service. You can add a FortiGate unit whether it is running in either NAT mode or transparent mode. The FortiManager appliance provides remote management of a FortiGate unit over TCP port 541.

If you have not already done so, register the FortiGate unit by visiting <http://support.fortinet.com> and select **Product Registration**. By registering your unit, you will receive updates to the FortiGuard services and will also ensure your access to technical support.

You must enable the FortiGate management option so the FortiGate unit can accept management updates to firmware and FortiGuard services.

To configure the FortiGate unit - GUI

1. Log in to the FortiGate unit.
2. Go to **System > Settings**.
3. Under **Central Management**, select FortiManager.
4. Enter the IP address of the FortiManager unit.
5. Select **Apply**.

The FortiManager ID now appears in the Trusted FortiManager table.

As an additional security measure, you can also select **Registration Password** and enter a password to connect to the FortiManager.

To configure the FortiGate unit - CLI

```
config system central-management
  set type fortimanager
  set fmg <ip_address>
end
```

To use the registration password, enter:

```
execute central-mgmt register-device <fmg-serial-no><fmg-register-password><fgt-username><fgt-password>
```

Configuring an SSL connection

An SSL connection can be configured between the two devices and an encryption level selected. Use the following CLI commands in the FortiGate CLI to configure the connection:

```
config system central-management
  set status enable
  set enc-algorithm {default* | high | low}
end
```

The default encryption automatically sets high and medium encryption algorithms. Algorithms used for high, medium, and low follows openssl definitions:

- **High** - Key lengths larger than 128 bits, and some cipher suites with 128-bit keys.

Algorithms are: DHE-RSA-AES256-SHA:AES256-SHA: EDH-RSA-DES-CBC3-SHA: DES-CBC3-SHA:DES-CBC3-MD5:DHE-RSA-AES128-SHA:AES128-SHA

- **Medium** - Key strengths of 128 bit encryption.

Algorithms are: RC4-SHA:RC4-MD5:RC4-MD

- **Low** - Key strengths of 64 or 56 bit encryption algorithms but excluding export cipher suites

Algorithms are: EDH-RSA-DES-CBC-SHA; DES-CBC-SHA; DES-CBC-MD5.

FortiManager configuration

Once the connection between the FortiGate unit and the FortiManager unit has been configured, you can add the FortiGate to the Device Manager in the FortiManager unit's web-based manager. For details on completing the configuration, see the [FortiManager Administration Guide](#).

Configuration updates through FortiManager

With the FortiManager system, you can monitor and configure multiple FortiGate units from one location. Using the FortiManager's Device Manager, you can view the FortiGate units and make the usual configuration updates and changes, without having to log in and out of multiple FortiGate units.

FortiManager enables you to complete the configuration, by going to the Device Manager, selecting the FortiGate unit and using the same menu structure and pages as you would see in the FortiGate web-based manager. All changes to the FortiGate configuration are stored locally on the FortiManager unit until you synchronize with the FortiGate unit.

When a FortiGate unit is under control of a FortiManager system, administrators will not be able to change the configuration using the FortiGate. When trying to change options, the unit displays a message that it is configured through FortiManager, and any changes may be reverted.

Global objects

If you are maintaining a number of FortiGate units within a network, many of the policies and configuration elements will be the same across the corporation. In these instances, the adding and editing of many of the same policies will become a tedious and error-prone activity. With FortiManager global objects, this level of configuration is simplified.

A global object is an object that is not associated specifically with one device or group. Global objects include security policies, a DNS server, VPN, and IP pools.

The Global Objects window is where you can configure global objects and copy the configurations to the FortiManager device database for a selected device or a group of devices. You can also import configurations from the FortiManager device database for a selected device and modify the configuration as required.

When configuring or creating a global policy object the interface, prompts, and fields are the same as creating the same object on a FortiGate unit using the FortiGate web-based manager.

Locking the FortiGate web-based manager

When you use the FortiManager to manage multiple FortiGate units, a local FortiGate unit becomes locked from any configuration changes using the web-based manager for most administrators. The `super_admin` will still be able to make changes to the configuration; however, this is not recommended as it may cause conflicts with the FortiManager.

FortiGuard

FortiManager can also connect to the FortiGuard Distribution Network (FDN) to receive push updates for IPS signatures and antivirus definitions. These updates can then be used to update multiple FortiGate units throughout an organization. By using the FortiManager as the host for updates, bandwidth use is minimized as updates are downloaded to one source instead of many.

To receive IPS and antivirus updates from FortiManager, indicate an alternate IP address on the FortiGate unit.

To configure updates from FortiManager

1. Go to **System > FortiGuard**.
2. Under **AntiVirus and IPS Updates**, enable both **Accept push updates** and **Use override push**.
3. Enter the IP address of the FortiManager unit.
4. Select **Apply**.

The central management FortiGuard server list can include FQDNs (354449)

This feature, introduced in FortiOS 5.4.0, implements support of FQDN, to make it an option for central-management server-list. This feature can be set through the GUI and the CLI.

GUI Changes

On **System > FortiGuard > Override FortiGuard Servers > Create New / Edit**, a new option, **FQDN** is added for **Address Type**.

CLI Changes

```
config server-list
  edit 1
    set server-type {update|rating}
    set addr-type {ipv4|ipv6|fqdn} <== added fqdn
    set server-address ipv4
    set server-address6 ipv6
    set fqdn FQDN <== added
  end
end
```

Sending malware statistics to FortiGuard

To support following Malware trends and making zero-day discoveries, FortiGate units send encrypted statistics to FortiGuard about IPS, Application Control, and AntiVirus events detected by the FortiGuard services running on your FortiGate. FortiGuard uses the statistics collected to achieve a balance between performance and security effectiveness by moving inactive signatures to an extended signature database.

The statistics include some non-personal information that identifies your FortiGate and its country. The information is never shared with external parties. You can choose to disable the sharing of this information by entering the following CLI command.

```
config system global
    set fds-statistics disable
end
```

Firmware updates

A FortiManager unit can also perform firmware updates for multiple FortiGate units, saving time rather than upgrading each FortiGate unit individually.

The FortiManager unit stores local copies of firmware images, either by downloading images from the Fortinet Distribution Network (FDN) or by accepting firmware images that are uploaded from the management computer.

If you are using the FortiManager unit to download firmware images, the FDN first validates device licenses and support contracts and then provides a list of currently available firmware images. For devices with valid Fortinet Technical Support contracts, you can download new firmware images from the FDN and the firmware release notes.

After firmware images have been either downloaded from the FDN or imported to the firmware list, you can either schedule or immediately upgrade/downgrade a device or group of device's firmware.

See the [FortiManager Administration Guide](#) for more information on updating the FortiGate firmware using the FortiManager central management.

Administrative domains

FortiManager administrative domains enable the super_admin to create groupings of devices for configured administrators to monitor and manage. FortiManager can manage a large number of Fortinet appliances. This enables administrators to maintain managed devices specific to their geographic location or business division. This also includes FortiGate units with multiple configured VDOMs.

Each administrator is tied to an administrative domain (ADOM). When that particular administrator logs in, they see only those devices or VDOMs configured for that administrator and ADOM. The one exception is the super_admin account that can see and maintain all administrative domains and the devices within those domains.

Administrative domains are not enabled by default and enabling and configuring the domains can only be performed by the super_admin.

The maximum number of administrative domains you can add depends on the FortiManager system model. See the [FortiManager Administration Guide](#) for information on the maximums for each model.

Backup and restore configurations

A FortiManager unit stores configuration files for backup and restore purposes. A FortiManager also enables you to save revisions of configuration files. Configuration backups occur automatically when the administrator logs out or the administrator login session expires.

FortiManager also enables you to view differences between different configurations to identify where changes have been made.

Monitoring

With network administration, the first step is installing and configuring the FortiGate unit to be the protector of the internal network. Once the system is running efficiently, the next step is to monitor the system and network traffic, making configuration changes as necessary when a threat or vulnerability is discovered.

This chapter discusses the various methods of monitoring both the FortiGate unit and the network traffic through a range of different tools available within FortiOS.

This section includes the topics:

- [Dashboard](#)
- [sFlow](#)
- [Monitor menus](#)
- [Logging](#)
- [Alert email](#)
- [SNMP](#)
- [SNMP get command syntax](#)

Dashboard

The FortiOS dashboard provides a location to view real-time system information. By default, the dashboard displays the key statistics of the FortiGate unit itself, providing the memory and CPU status, as well as the health of the ports, whether they are up or down and their throughput.

Widgets

Within the Dashboard is a number of smaller windows, called widgets, that provide this status information. Beyond what is visible by default, you can add a number of other widgets that display other key traffic information including application use, traffic per IP address, top attacks, traffic history and logging statistics.

You can add multiple dashboards to reflect what data you want to monitor, and add the widgets accordingly. Dashboard configuration is only available through the GUI. Administrators must have read and write privileges to customize and add widgets when in either menu. Administrators must have read privileges if they want to view the information.

To add a dashboard and widgets

1. Go to **Dashboard**.
2. Select the **Dashboard** menu at the top of the window and select **Add Dashboard**.
3. Enter a name.
4. Select the **Widget** menu at the top of the window.
5. From the screen, select the type of information you want to add.
6. When done, select the X in the top right of the widget.

Dashboard widgets provide an excellent method to view real-time data about the events occurring on the FortiGate unit and the network. For example, by adding the Network Protocol Usage widget, you can monitor the activity of various protocols over a selected span of time. Based on that information you can add or adjust traffic shaping and/or security policies to control traffic.

License Information

The **License Information** widget displays summary information for your:

- Support Contract
- FortiGuard services
- FortiCloud account
- FortiSandbox license
- FortiClient connections
- FortiToken Mobile tokens assigned

The FortiClient connections section displays the number of FortiClient connections allowed and the number of users connecting. By selecting the **Details** link for the number of connections, you can view more information about the connecting user, including IP address, user name, and the user's operating system type. Included with this information is a link for Mac and Windows. Selecting these links automatically downloads the FortiClient install file (.dmg or .exe) to the management computer.

sFlow

sFlow is a method of monitoring the traffic on your network to identify areas on the network that may impact performance and throughput. FortiOS implements sFlow version 5.

sFlow uses packet sampling to monitor network traffic. The sFlow Agent captures packet information at defined intervals and sends them to an sFlow Collector for analysis, providing real-time data analysis. The information sent is only a sampling of the data for minimal impact on network throughput and performance.

The sFlow Agent is embedded in the FortiGate unit. Once configured, the FortiGate unit sends sFlow datagrams of the sampled traffic to the sFlow Collector, also called an sFlow Analyzer. The sFlow Collector receives the datagrams, and provides real-time analysis and graphing to indicate where potential traffic issues are occurring. sFlow Collector software is available from a number of third party software vendors.

sFlow data captures only a sampling of network traffic, not all traffic like the traffic logs on the FortiGate unit. Sampling works by the sFlow Agent looking at traffic packets when they arrive on an interface. A decision is made whether the packet is dropped and allowed to be to its destination or if a copy is forwarded to the sFlow Collector. The sample used and its frequency are determined during configuration.

sFlow is not supported on virtual interfaces such as vdom link, ipsec, ssl.root or gre.

The sFlow datagram sent to the Collector contains the information:

- Packet header (e.g. MAC,IPv4,IPv6,IPX,AppleTalk,TCP,UDP, ICMP)
- Sample process parameters (rate, pool etc.)
- Input/output ports
- Priority (802.1p and TOS)
- VLAN (802.1Q)

- Source/destination prefix
- Next hop address
- Source AS, Source Peer AS
- Destination AS Path
- Communities, local preference
- User IDs (TACACS/RADIUS) for source/destination
- URL associated with source/destination
- Interface statistics (RFC 1573, RFC 2233, and RFC 2358)

sFlow agents can be added to any type of FortiGate interface. sFlow isn't supported on some virtual interfaces such as VDOM link, IPsec, gre, and ssl.root.

For more information on sFlow, Collector software and sFlow MIBs, visit www.sflow.org.

Configuration

sFlow configuration is available only from the CLI. Configuration requires two steps: enabling the sFlow Agent and configuring the interface for the sampling information.

Enable sFlow

```
config system sflow
  set collector-ip <ip_address>
  set collector-port <port_number>
  set source-ip <ip_address>
end
```

The default port for sFlow is UDP 6343. To configure in VDOM, use the commands:

```
config system vdom-sflow
  set vdom-sflow enable
  set collector-ip <ip_address>
  set collector-port <port_number>
  set source-ip <ip_address>
end
```

Configure sFlow agents per interface.

```
config system interface
  edit <interface_name>
    set sflow-sampler enable
    set sample-rate <every_n_packets>
    set sample-direction [tx | rx | both]
    set polling-interval <seconds>
  end
```

Monitor menus

The **Monitor** menus enable you to view session and policy information and other activity occurring on your FortiGate unit. The monitors provide the details of user activity, traffic and policy usage to show live activity.

Monitors are available for DHCP, routing, security policies, traffic shaping, load balancing, security features, VPN, users, and WiFi.

Logging

FortiOS provides a robust logging environment that enables you to monitor, store, and report traffic information and FortiGate events, including attempted log ins and hardware status. Depending on your requirements, you can log to a number of different hosts.

To configure logging in the web-based manager, go to **Log & Report > Log Settings**.

To configure logging in the CLI use the commands `config log <log_location>`.

For details on configuring logging see the [Logging and Reporting Guide](#).

If you will be using several FortiGate units, you can also use a FortiAnalyzer unit for logging. For more information, see the FortiAnalyzer Administration Guide.

Syslog server

An industry standard for collecting log messages, for off-site storage. In the web-based manager, you are able to send logs to a single syslog server, however in the CLI you can configure up to three syslog servers where you can also use multiple configuration options. For example, send traffic logs to one server, antivirus logs to another. The FortiGate unit sends Syslog traffic over UDP port 514. Note that if a secure tunnel is configured for communication to a FortiAnalyzer unit, then Syslog traffic will be sent over an IPsec connection, using UDP 500/4500, Protocol IP/50.

To configure a Syslog server in the web-based manager, go to **Log & Report > Log Settings**. In the CLI use the commands:

```
config log syslogd setting
  set status enable
  set server <IP address or FQDN of syslog server>
end
```

Further options are available when enabled to configure a different port, facility and server IP address.

For Syslog traffic, you can identify a specific port/IP address for logging traffic. Configuration of these services is performed in the CLI, using the command `set source-ip`. When configured, this becomes the dedicated port to send this traffic over.

For example, to set the source IP of a Syslog server to be on the DMZ1 port with an IP of 192.168.4.5, the commands are:

```
config log syslogd setting
  set status enable
  set source-ip 192.168.4.5
end
```



You must configure the secure tunnel on **both** ends of the tunnel, the FortiGate unit and the FortiAnalyzer unit.

Alert email

As an administrator, you want to be certain you can respond quickly to issues occurring on your network or on the FortiGate unit. Alert emails provide an efficient and direct method of notifying an administrator of events. By configuring alert messages, you can define the threshold when a problem becomes critical and needs attention. When this threshold is reached, the FortiGate unit will send an email to one or more individuals, notifying them of the issue.

In the following example, the FortiGate unit is configured to send email to two administrators (admin1 and admin2) when multiple intrusions are detected every two minutes. The FortiGate unit has its own email address on the mail server.

To configure the email service

1. Go to **System > Config > Advanced**.
2. In the **Email Service**, complete the following and select **Apply**:

SMTP Server	Enter the address or name of the email server. For example, <code>smtp.example.com</code> .
Default Reply To	Enter an email address to associate with the alert email. This field is optional. If you enter an email address here, it overrides the email address entered when configuring alert email in Log & Report > Alert E-mail .
Authentication	Enable authentication if required by the email server.
Security mode	Choose between <i>None</i> , <i>SMTPS</i> or <i>STARTTLS</i>
Port	25

To configure alert email - web-based manager

1. Go to **Log & Report > Log Config > Alert E-mail**.
2. Enter the information:

Email from	fortigate@example.com
Email to	admin1@example.com
	admin2@example.com

3. For the **Interval Time**, enter 2.
4. Select **Intrusion Detected**.
5. Select **Apply**.

To configure alert email - CLI

```
config system email-server
  set port 25
  set server smtp.example.com
  set authenticate enable
```



```
set username FortiGate
set password *****
end
config alertemail setting
set username fortigate@example.com
set mailto1 admin1@example.com
set mailto2 admin2@example.com
set filter category
set IPS-logs enable
end
```

SNMP

Simple Network Management Protocol (SNMP) enables you to monitor hardware on your network. You can configure the hardware, such as the FortiGate SNMP agent, to report system information and send traps (alarms or event messages) to SNMP managers. An SNMP manager, or host, is a typically a computer running an application that can read the incoming trap and event messages from the agent and send out SNMP queries to the SNMP agents. A FortiManager unit can act as an SNMP manager to one or more FortiGate units. FortiOS supports SNMP using IPv4 and IPv6 addressing.

By using an SNMP manager, you can access SNMP traps and data from any FortiGate interface or VLAN subinterface configured for SNMP management access. Part of configuring an SNMP manager is to list it as a host in a community on the FortiGate unit it will be monitoring. Otherwise, the SNMP monitor will not receive any traps from that FortiGate unit or be able to query that unit.

The FortiGate SNMP implementation is read-only. SNMP v1, v2c, and v3 compliant SNMP managers have read-only access to FortiGate system information through queries and can receive trap messages from the FortiGate unit.

To monitor FortiGate system information and receive FortiGate traps, you must first compile the Fortinet and FortiGate Management Information Base (MIB) files. A MIB is a text file that describes a list of SNMP data objects that are used by the SNMP manager. These MIBs provide information the SNMP manager needs to interpret the SNMP trap, event, and query messages sent by the FortiGate unit SNMP agent.

FortiGate core MIB files are available for download by going to **System > SNMP** and selecting the download link on the page.

The Fortinet implementation of SNMP includes support for most of RFC 2665 (Ethernet-like MIB) and most of RFC 1213 (MIB II). For more information, see [“Fortinet MIBs”](#). RFC support for SNMP v3 includes Architecture for SNMP Frameworks (RFC 3411), and partial support of User-based Security Model (RFC 3414).

SNMP traps alert you to events that occur such as a full log disk or a virus detected.

SNMP fields contain information about the FortiGate unit, such as CPU usage percentage or the number of sessions. This information is useful for monitoring the condition of the unit on an ongoing basis and to provide more information when a trap occurs.

The FortiGate SNMP v3 implementation includes support for queries, traps, authentication, and privacy. Authentication and encryption are configured in the CLI. See the `system snmp user` command in the FortiGate CLI Reference.

SNMP configuration settings

Before a remote SNMP manager can connect to the FortiGate agent, you must configure one or more FortiGate interfaces to accept SNMP connections by going to **Network > Interfaces**. Select the interface and, in the **Administrative Access**, select **SNMP**.

For VDOMS, SNMP traps can only be sent on interfaces in the management VDOM. Traps cannot be sent over other interfaces outside the management VDOM.

To configure SNMP settings, go to **System > SNMP**.

SNMP Agent	Select to enable SNMP communication.
Description	Enter descriptive information about the FortiGate unit. The description can be up to 35 characters.
Location	Enter the physical location of the FortiGate unit. The system location description can be up to 35 characters long.
Contact	Enter the contact information for the person responsible for this FortiGate unit. The contact information can be up to 35 characters.
SNMP v1/v2c section To create a new SNMP community, see SNMP Community .	
Community Name	The name to identify the community.
Queries	Indicates whether queries protocols (v1 and v2c) are enabled or disabled. A green check mark indicates queries are enabled; a gray x indicates queries are disabled. If one query is disabled and another one enabled, there will still be a green check mark.
Traps	Indicates whether trap protocols (v1 and v2c) are enabled or disabled. A green check mark indicates traps are enabled; a gray x indicates traps are disabled. If one query is disabled and another one enabled, there will still be a green check mark.
Enable	Select the check box to enable or disable the community.
SNMP v3 section To create a new SNMP community, see SNMP Community page.	
User Name	The name of the SNMPv3 user.
Security Level	The security level of the user.
Notification Host	The IP address or addresses of the host.
Queries	Indicates whether queries are enabled or disabled. A green check mark indicates queries are enabled; a gray x indicates queries are disabled

New SNMP Community page	
Community Name	Enter a name to identify the SNMP community
Hosts (section)	
IP Address	<p>Enter the IP address and Identify the SNMP managers that can use the settings in this SNMP community to monitor the FortiGate unit.</p> <p>You can also set the IP address to 0.0.0.0 to so that any SNMP manager can use this SNMP community.</p>
Delete	Removes an SNMP manager from the list within the Hosts section.
Add	Select to add a blank line to the Hosts list. You can add up to eight SNMP managers to a single community.
Queries (section)	
Protocol	The SNMP protocol. In the v1 row, this means that the settings are for SNMP v1. In the v2c row, this means that the settings are for SNMP v2c.
Port	<p>Enter the port number (161 by default) that the SNMP managers in this community use for SNMP v1 and SNMP v2c queries to receive configuration information from the FortiGate unit. Select the Enable check box to activate queries for each SNMP version.</p> <p>Note: The SNMP client software and the FortiGate unit must use the same port for queries.</p>
Enable	Select to enable that SNMP protocol.
Traps (section)	
Protocol	The SNMP protocol. In the v1 row, this means that the settings are for SNMP v1. In the v2c row, this means that the settings are for SNMP v2c.
Local	<p>Enter the remote port numbers (port 162 for each by default) that the FortiGate unit uses to send SNMP v1 or SNMP v2c traps to the SNMP managers in this community. Select the Enable check box to activate traps for each SNMP version.</p> <p>Note: The SNMP client software and the FortiGate unit must use the same port for traps.</p>

Remote	<p>Enter the remote port number (port 162 is default) that the FortiGate unit uses to send SNMP v1 or v2c traps to the SNMP managers in this community.</p> <p>Note: The SNMP client software and the FortiGate unit must use the same port for queries.</p>
Enable	Select to activate traps for each SNMP version.
SNMP Event	<p>Enable each SNMP event for which the FortiGate unit should send traps to the SNMP managers in this community.</p> <p>CPU Over usage traps sensitivity is slightly reduced, by spreading values out over 8 polling cycles. This prevents sharp spikes due to CPU intensive short-term events such as changing a policy.</p> <p>Power Supply Failure event trap is available only on some models.</p> <p>AMC interfaces enter bypass mode event trap is available only on models that support AMC modules.</p>
Enable	Select to enable the SNMP event.
Create New SNMP V3 User	
User Name	Enter the name of the user.
Security Level	Select the type of security level the user will have.
Notification Host	Enter the IP address of the notification host. If you want to add more than one host, after entering the IP address of the first host, select the plus sign to add another host.
Enable Query	Select to enable or disable the query. By default, the query is enabled.
Port	Enter the port number in the field.
Events	Select the SNMP events that will be associated with that user.

Gigabit interfaces

When determining the interface speed of a FortiGate unit with a 10G interface, the IF-MIB.ifSpeed may not return the correct value. IF-MIB.ifSpeed is a 32-bit gauge used to report interface speeds in bits/second and cannot convert to a 64-bit value. The 32-bit counter wrap the output too fast to be accurate.

In this case, you can use the value ifHighSpeed. It reports interface speeds in megabits/second. This ensures that 10Gb interfaces report the correct value.

SNMP agent

You need to first enter information and enable the FortiGate SNMP Agent. Enter information about the FortiGate unit to identify it so that when your SNMP manager receives traps from the FortiGate unit, you will know which unit sent the information.

To configure the SNMP agent - GUI

1. Go to **System > SNMP**.
2. Select **Enable** for the **SNMP Agent**.
3. Enter a descriptive name for the agent.
4. Enter the location of the FortiGate unit.
5. Enter a contact or administrator for the SNMP Agent or FortiGate unit.
6. Select **Apply**.

To configure SNMP agent - CLI

```
config system snmp sysinfo
    set status enable
    set contact-info <contact_information>
    set description <description_of_FortiGate>
    set location <FortiGate_location>
end
```

SNMP community

An SNMP community is a grouping of devices for network administration purposes. Within that SNMP community, devices can communicate by sending and receiving traps and other information. One device can belong to multiple communities, such as one administrator terminal monitoring both a firewall SNMP and a printer SNMP community.

Add SNMP communities to your FortiGate unit so that SNMP managers can connect to view system information and receive SNMP traps.

You can add up to three SNMP communities. Each community can have a different configuration for SNMP queries and traps. Each community can be configured to monitor the FortiGate unit for a different set of events. You can also add the IP addresses of up to 8 SNMP managers to each community.

When the FortiGate unit is in virtual domain mode, SNMP traps can only be sent on interfaces in the management virtual domain. Traps cannot be sent over other interfaces.

To add an SNMP v1/v2c community - GUI

1. Go to **System > SNMP**.
2. In the **SNMP v1/v2c** area, select **Create New**.
3. Enter a **Community Name**.
4. Enter the IP address and Identify the SNMP managers that can use the settings in this SNMP community to monitor the FortiGate unit.
5. Select the interface if the SNMP manager is not on the same subnet as the FortiGate unit.

6. Enter the **Port** number that the SNMP managers in this community use for SNMP v1 and SNMP v2c queries to receive configuration information from the FortiGate unit. Select the **Enable** check box to activate queries for each SNMP version.
7. Enter the Local and Remote port numbers that the FortiGate unit uses to send SNMP v1 and SNMP v2c traps to the SNMP managers in this community.
8. Select the **Enable** check box to activate traps for each SNMP version.
9. Select **OK**.

To add an SNMP v1/v2c community - CLI

```
config system snmp community
  edit <index_number>
    set events <events_list>
    set name <community_name>
    set query-v1-port <port_number>
    set query-v1-status {enable | disable}
    set query-v2c-port <port_number>
    set query-v2c-status {enable | disable}
    set status {enable | disable}
    set trap-v1-lport <port_number>
    set trap-v1-rport <port_number>
    set trap-v1-status {enable | disable}
    set trap-v2c-lport <port_number>
    set trap-v2c-rport <port_number>
    set trap-v2c-status {enable | disable}
  end
```

To add an SNMP v3 community - GUI

1. Go to **System > SNMP**.
2. In the **SNMP v3** area, select **Create New**.
3. Enter a **User Name**.
4. Select a **Security Level** and associated authorization algorithms.
5. Enter the IP address of the **Notification Host** SNMP managers that can use the settings in this SNMP community to monitor the FortiGate unit.
6. Enter the **Port** number that the SNMP managers in this community use to receive configuration information from the FortiGate unit. Select the **Enable** check box to activate queries for each SNMP version.
7. Select the **Enable** check box to activate traps.
8. Select **OK**.

To add an SNMP v3 community - CLI

```
config system snmp user
  edit <index_number>
    set security-level [auth-priv | auth-no-priv | no-auth-no-priv]
    set queries enable
    set query-port <port_number>
    set notify-hosts <ip_address>
    set events <event_selections>
  end
```

Enabling on the interface

Before a remote SNMP manager can connect to the FortiGate agent, you must configure one or more FortiGate interfaces to accept SNMP connections.

To configure SNMP access - GUI

1. Go to **Network > Interfaces**.
2. Choose an interface that an SNMP manager connects to and select **Edit**.
3. In **Administrative Access**, select **SNMP**.
4. Select **OK**.

To configure SNMP access - CLI

```
config system interface
    edit <interface_name>
        set allowaccess snmp
    end
```



If the interface you are configuring already has protocols that are allowed access, use the command `append allowaccess snmp` instead, or else the other protocols will be replaced. For more information, see Adding and removing options from lists.

Fortinet MIBs

The FortiGate SNMP agent supports Fortinet proprietary MIBs as well as standard RFC 1213 and RFC 2665 MIBs. RFC support includes support for the parts of RFC 2665 (Ethernet-like MIB) and the parts of RFC 1213 (MIB II) that apply to FortiGate unit configuration.

There are two MIB files for FortiGate units - the Fortinet MIB, and the FortiGate MIB. The Fortinet MIB contains traps, fields and information that is common to all Fortinet products. The FortiGate MIB contains traps, fields and information that is specific to FortiGate units. Each Fortinet product has its own MIB. If you use other Fortinet products you will need to download their MIB files as well. Both MIB files are used for FortiOS and FortiOS Carrier; there are no additional traps for the Carrier version of the operating system.

The Fortinet MIB and FortiGate MIB along with the two RFC MIBs are listed in tables in this section. You can download the two FortiGate MIB files from Fortinet Customer Support. The Fortinet MIB contains information for Fortinet products in general. the Fortinet FortiGate MIB includes the system information for The FortiGate unit and version of FortiOS. Both files are required for proper SNMP data collection.

To download the MIB files, go to **System > SNMP** and select a MIB link in the **FortiGate SNMP MIB** section.

Your SNMP manager may already include standard and private MIBs in a compiled database that is ready to use. You must add the Fortinet proprietary MIB to this database to have access to the Fortinet specific information.



There were major changes to the MIB files between FortiOS Carrier v3.0 and v4.0. You need to use the new MIBs for FortiOS Carrier v4.0 or you may mistakenly access the wrong traps and fields.

MIB files are updated for each version of FortiOS. When upgrading the firmware ensure that you updated the Fortinet FortiGate MIB file as well.

Fortinet MIBs

MIB file name or RFC	Description
FORTINET-CORE-MIB.mib	<p>The Fortinet MIB includes all system configuration information and trap information that is common to all Fortinet products.</p> <p>Your SNMP manager requires this information to monitor FortiGate unit configuration settings and receive traps from the FortiGate SNMP agent.</p>
FORTINET-FORTIGATE-MIB.mib	<p>The FortiGate MIB includes all system configuration information and trap information that is specific to FortiGate units.</p> <p>Your SNMP manager requires this information to monitor FortiGate configuration settings and receive traps from the FortiGate SNMP agent. FortiManager systems require this MIB to monitor FortiGate units.</p>
RFC-1213 (MIB II)	<p>The FortiGate SNMP agent supports MIB II groups with these exceptions.</p> <ul style="list-style-type: none"> • No support for the EGP group from MIB II (RFC 1213, section 3.11 and 6.10). • Protocol statistics returned for MIB II groups (IP/ICMP/TCP/UDP/etc.) do not accurately capture all FortiGate traffic activity. More accurate information can be obtained from the information reported by the Fortinet MIB.
RFC-2665 (Ethernet-like MIB)	<p>The FortiGate SNMP agent supports Ethernet-like MIB information. FortiGate SNMP does not support for the dot3Tests and dot3Errors groups.</p>



SNMP improvements for dynamic routing include support for RFC 4750 OSPF Version 2 Management Information Base and RFC 5643 Management Information Base for OSPFv3. These changes add the capability of logging dynamic routing activity. Examples include sending OSPF routing events or changes to a syslog server or FortiAnalyzer or changes in neighborhood status.

Device Detection for SNMP Traps in FortiOS 5.4.0

This setting is related to the device detection feature. It allows SNMP traps to detect when a new device comes online. Within SNMP configurations there is a configurable timeout setting that periodically checks for the device. When a check determines that the device is present a trap is sent.

In the GUI, when configuring an SNMP object, one of the settings is a checkbox, under **SNMP Events** for **Device detected**.

To configure the SNMP object in the CLI use the following syntax:

```
config system snmp community
  edit <community ID number>
    set name <string>
    set events device-new
  end
```


In order to configure the idle timeout for the device, use the following syntax in the CLI:

```
config system global
  set device-idle-timeout <integer of time in seconds>
end
```

The time value for the field can be set from 30 to 31536000.

SNMP get command syntax

Normally, to get configuration and status information for a FortiGate unit, an SNMP manager would use an SNMP get commands to get the information in a MIB field. The SNMP get command syntax would be similar to:

```
snmpget -v2c -c <community_name> <address_ipv4> {<OID> | <MIB_field>}
```

...where...

<community_name> is an SNMP community name added to the FortiGate configuration. You can add more than one community name to a FortiGate SNMP configuration. The most commonly used community name is public.

<address_ipv4> is the IP address of the FortiGate interface that the SNMP manager connects to.

{<OID> | <MIB_field>} is the object identifier (OID) for the MIB field or the MIB field name itself.

The `SNMP get` command gets firmware version running on the FortiGate unit. The community name is public. The IP address of the interface configured for SNMP management access is 10.10.10.1. The firmware version MIB field is `fgSysVersion` and the OID for this MIB field is 1.3.6.1.4.1.12356.101.4.1.1. The first command uses the MIB field name and the second uses the OID:

```
snmpget -v2c -c public 10.10.10.1 fgSysVersion.0
snmpget -v2c -c public 10.10.10.1 1.3.6.1.4.1.12356.101.4.1.1.0
```



The OIDs and object names used in these examples are dependent on the version of MIB and are subject to change.

Replacement messages

The replacement message list in **System > Replacement Messages**.

The replacement messages list enables you to view and customize replacement messages. Highlight the replacement messages you wish to edit and customize the message content to your requirements. Hit **Save** when done.

Should you make a major error to the code, you can select the **Restore Default** to return to the original message and code base.

For connections requiring authentication, the FortiGate unit uses HTTP to send an authentication disclaimer page for the user to accept before a security policy is in effect. Therefore, the user must initiate HTTP traffic first in order to trigger the authentication disclaimer page. Once the disclaimer is accepted, the user can send whatever traffic is allowed by the security policy.

Replacement message images

You can add images to replacement messages to:

- Disclaimer pages
- Login pages
- Declined disclaimer pages
- Login failed page
- Login challenge pages
- Keepalive pages

Image embedding is also available to the endpoint NAC download portal and recommendation portal replacement messages, as well as HTTP replacement messages.

Supported image formats are GIF, JPEG, TIFF and PNG. The maximum file size supported is 6000 bytes.

Adding images to replacement messages

To upload an image for use in a message

1. Go to **System > Replacement Messages**.
2. Select **Manage Images** at the top of the page.
3. Select **Create New**.
4. Enter a **Name** for the image.
5. Select the **Content Type**.
6. Select **Browse** to locate the file and select **OK**.

The image that you include in a replacement message, must have the following html:

```
<img src=%%IMAGE: <config_image_name>%% size=<bytes> >
```

For example:

```
<img src=%%IMAGE: logo_hq%% size=4272>
```

Modifying replacement messages

Replacement messages can be modified to include a message or content that suits your organization.

Use the expand arrows to view the replacement message list for a given category. Messages are in HTML format. To change a replacement message, go to **System > Replacement Messages** select the replacement message that you want to modify. At the bottom pane of the window, you can see the message on one side and the HTML code on the other side. The message view changes in real-time as you change the content.

A list of common replacement messages appears in the main window. To see the entire list and all categories of replacement messages, in the upper-right corner of the window, select **Extended View**.

Replacement message categories

Alert Email replacement messages

The FortiGate unit adds the replacement messages listed in this category to alert email messages sent to administrators. If you enable the option **Send alert email for logs based on severity** in **Log & Report**, you control whether or not replacement messages are sent by alert email based on how you set the **Minimum log level**.

For more information on Alert emails, see the Monitoring chapter.

Authentication replacement messages

The FortiGate unit uses the text of the authentication replacement messages for various user authentication HTML pages that are displayed when a user is required to authenticate because a security policy includes at least one identity-based policy that requires firewall users to authenticate.

These replacement message pages are for authentication using HTTP and HTTPS. You cannot customize the firewall authentication messages for FTP and Telnet.

The authentication login page and the authentication disclaimer include replacement tags and controls not found on other replacement messages.

Users see the authentication login page when they use a VPN or a security policy that requires authentication. You can customize this page in the same way as you modify other replacement messages.

There are some unique requirements for these replacement messages:

- The login page must be an HTML page containing a form with `ACTION="/"` and `METHOD="POST"`
- The form must contain the following hidden controls:
 - `<INPUT TYPE="hidden" NAME="%%MAGICID%%" VALUE="%%MAGICVAL%%">`
 - `<INPUT TYPE="hidden" NAME="%%STATEID%%" VALUE="%%STATEVAL%%">`
 - `<INPUT TYPE="hidden" NAME="%%REDIRID%%" VALUE="%%PROTURI%%">`
- The form must contain the following visible controls:
 - `<INPUT TYPE="text" NAME="%%USERNAMEID%%" size=25>`
 - `<INPUT TYPE="password" NAME="%%PASSWORDID%%" size=25>`

Example

The following is an example of a simple authentication page that meets the requirements listed above.

```
<HTML><HEAD><TITLE>Firewall Authentication</TITLE></HEAD>
  <BODY><H4>You must authenticate to use this service.</H4>
<FORM ACTION="/" method="post">
  <INPUT NAME="%%MAGICID%%" VALUE="%%MAGICVAL%%" TYPE="hidden">
<TABLE ALIGN="center" BGCOLOR="#00cccc" BORDER="0"
  CELLPADDING="15" CELLSPACING="0" WIDTH="320"><TBODY>
<TR><TH>Username:</TH>
  <TD><INPUT NAME="%%USERNAMEID%%" SIZE="25" TYPE="text"> </TD></TR>
<TR><TH>Password:</TH>
  <TD><INPUT NAME="%%PASSWORDID%%" SIZE="25" TYPE="password"> </TD></TR>
<TR><TD COLSPAN="2" ALIGN="center" BGCOLOR="#00cccc">
  <INPUT NAME="%%STATEID%%" VALUE="%%STATEVAL%%" TYPE="hidden">
    <INPUT NAME="%%REDIRID%%" VALUE="%%PROTURI%%" TYPE="hidden">
    <INPUT VALUE="Continue" TYPE="submit"> </TD></TR>
</TBODY></TABLE></FORM></BODY></HTML>
```

Captive Portal Default replacement messages

The Captive Portal Default replacement messages are used for wireless authentication only. You must have a VAP interface with the security set as captive portal to trigger these replacement messages.

Device Detection Portal replacement message

The FortiGate unit displays the replacement message when the FortiGate unit cannot determine the type of BYOD or handheld device is used to connect the network.

Email replacement messages

The FortiGate unit sends the mail replacement messages to email clients using IMAP, POP3, or SMTP when an event occurs such as antivirus blocking a file attached to an email that contains a virus. Email replacement messages are text messages.

If the FortiGate unit supports SSL content scanning and inspection these replacement messages can also be added to IMAPS, POP3S, and SMTPS email messages.

Endpoint Control replacement message

The FortiGate unit displays the replacement message when the FortiClient Endpoint Security software is not installed or registered correctly with the FortiGate unit.

FortiGuard Web Filtering replacement messages

The FortiGate unit sends the FortiGuard Web Filtering replacement messages to web browsers using the HTTP protocol when FortiGuard web filtering blocks a URL, provides details about blocked HTTP 4xx and 5xx errors, and for FortiGuard overrides. FortiGuard Web Filtering replacement messages are HTTP pages.

If the FortiGate unit supports SSL content scanning and inspection and if **Protocol Recognition > HTTPS Content Filtering Mode** is set to Deep Scan in the antivirus profile, these replacement messages can also replace web pages downloaded using the HTTPS protocol.

FTP replacement messages

The FortiGate unit sends the FTP replacement messages listed in the table below to FTP clients when an event occurs such as antivirus blocking a file that contains a virus in an FTP session. FTP replacement messages are text messages.

HTTP replacement messages

The FortiGate unit sends the HTTP replacement messages listed in the following table to web browsers using the HTTP protocol when an event occurs such as antivirus blocking a file that contains a virus in an HTTP session. HTTP replacement messages are HTML pages.

If the FortiGate unit supports SSL content scanning and inspection, and if under HTTPS in the protocol option list has Enable Deep Scan enabled, these replacement messages can also replace web pages downloaded using the HTTPS protocol.

IM replacement messages

The FortiGate unit sends the IM replacement messages to IM clients using AIM, ICQ, MSN, or Yahoo! Messenger when an event occurs such as antivirus blocking a file attached to an email that contains a virus. IM replacement messages are text messages.

NNTP replacement messages

The FortiGate unit sends the NNTP replacement messages NNTP clients when an event occurs such as antivirus blocking a file attached to an NNTP message that contains a virus. NNTP replacement messages are text messages.

Spam replacement messages

The FortiGate unit adds the Spam replacement messages to SMTP server responses if the email message is identified as spam and the spam action is discard. If the FortiGate unit supports SSL content scanning and inspection these replacement messages can also be added to SMTPS server responses.

NAC quarantine replacement messages

The page that is displayed for the user depends on whether NAC quarantine blocked the user because a virus was found, a DoS sensor detected an attack, an IPS sensor detected an attack, or a DLP rule with action set to **Quarantine IP address** or **Quarantine Interface** matched a session from the user.

The default messages inform the user of why they are seeing this page and recommend they contact the system administrator. You can customize the pages as required, for example to include an email address or other contact information or if applicable a note about how long the user can expect to be blocked.

SSL VPN replacement messages

The SSL VPN login replacement message is an HTML replacement message that formats the FortiGate SSL VPN portal login page. You can customize this replacement message according to your organization's needs. The page is linked to FortiGate functionality and you must construct it according to the following guidelines to ensure that it will work.

- The login page must be an HTML page containing a form with `ACTION="%SSL_ACT%"` and `METHOD="%SSL_METHOD%"`
- The form must contain the `%SSL_LOGIN%` tag to provide the login form.
- The form must contain the `%SSL_HIDDEN%` tag.

Web Proxy replacement messages

The FortiGate unit sends Web Proxy replacement messages when a web proxy event occurs that is detected and matches the web proxy configuration. These replacement messages are web pages that appear within your web browser.

The following web proxy replacement messages require an identity-based security policy so that the web proxy is successful. You can also enable FTP-over-HTTP by selecting the **FTP** option in **System > Network > Explicit Proxy**.

Traffic quota control replacement messages

When user traffic is going through the FortiGate unit and it is blocked by traffic shaping quota controls, users see the **Traffic shaper block message** or the **Per IP traffic shaper block message** when they attempt to connect through the FortiGate unit using HTTP.

The traffic quota HTTP pages should contain the `%%QUOTA_INFO%%` tag to display information about the traffic shaping quota setting that is blocking the user.

MM1 replacement messages

MM1 replacement messages are sent when, during MMS content scanning, FortiOS Carrier detects, for example a virus, using the MMS profile.

You must have **Remove Blocked** selected within the MMS profile if you want to remove the content that is intercepted during MMS scanning on the FortiGate unit.

MM3 replacement messages

MM3 replacement messages are sent when, during MMS content scanning, FortiOS Carrier detects, for example a virus, using the MMS profile.

You must have **Remove Blocked** selected within the MMS profile if you want to remove the content that is intercepted during MMS scanning on the unit.

MM4 replacement messages

MM4 replacement messages are sent when, during MMS content scanning, FortiOS Carrier detects, for example a virus, using the MMS profile.

MM7 replacement messages

MM7 replacement messages are sent when, during MMS content scanning, FortiOS Carrier detects, for example a virus, using the MMS profile.

MMS replacement messages

The MMS replacement message is sent when a section of an MMS message has been replaced because it contains a blocked file. This replacement message is in HTML format.

The message text is:

```
<HTML><BODY>This section of the message has been replaced because it contained a blocked  
file</BODY></HTML>
```

Replacement message groups

Replacement message groups enable you to view common messages in groups for large carriers. Message groups can be configured by going to **Config > Replacement Message Group**.

Using the defined groups, you can manage specific replacement messages from a single location, rather than searching through the entire replacement message list.

If you enable virtual domains (VDOMs) on the FortiGate unit, replacement message groups are configured separately for each virtual domain. Each virtual domain has its own default replacement message group, configured from **System > Replacement Messages Group**.

When you modify a message in a replacement message group, a Reset icon appears beside the message in the group. You can select this Reset icon to reset the message in the replacement message group to the default version.

All MM1/4/7 notification messages for FortiOS Carrier (and MM1 retrieve-conf messages) can contain a SMIL layer and all MM4 notification messages can contain an HTML layer in the message. These layers can be used to brand messages by using logos uploaded to the FortiGate unit via the 'Manage Images' link found on the replacement message group configuration page.

Administration for schools

For system administrator in the school system it is particularly difficult to maintain a network and access to the Internet. There are potential legal liabilities if content is not properly filtered and children are allowed to view pornography and other non-productive and potentially dangerous content. For a school, too much filtering is better than too little. This section describes some basic practices administrators can employ to help maintain control without being too draconian for access to the internet.

Security policies

The default security policies in FortiOS allow all traffic on all ports and all IP addresses. Not the most secure. While applying UTM profiles can help to block viruses, detect attacks and prevent spam, this doesn't provide a solid overall security option. The best approach is a layered approach; the first layer being the security policy.

When creating outbound security policies, you need to know the answer to the question "What are the students allowed to do?" The answer is surf the web, connect to FTP sites, send/receive email, and so on.

Once you know what the students need to do, you can research the software used and determine the ports the applications use. For example, if the students only require web surfing, then there are only two ports (80 - HTTP and 443 - HTTPS) needed to complete their tasks. Setting the security policies to only allow traffic through two ports (rather than all 65,000), this will significantly lower any possible exploits. By restricting the ports to known services, means stopping the use of proxy servers, as many of them operate on a non-standard port to hide their traffic from URL filtering or HTTP inspection.

DNS

Students should not be allowed to use whatever DNS they want. this opens another port for them to use and potentially smuggle traffic on. The best approach is to point to an internal DNS server and only allow those devices out on port 53. Its the same approach one would use for SMTP. Only allow the mail server to use port 25 since nothing else should be sending email.

If there is no internal DNS server, then the list of allowed DNS servers they can use should be restrictive. One possible exploit would be for them to set up their own DNS server at home that serves different IPs for known hosts, such as having Google.com sent back the IP for playboy.com.

Encrypted traffic (HTTPS)

Generally speaking, students should not be allowed to access encrypted web sites. Encrypted traffic cannot be sniffed, and therefore, cannot be monitored. HTTPS traffic should only be allowed when necessary. Most web sites a student needs to access are HTTP, not HTTPS. Due to the nature of HTTPS protocol, and the fact that encryption is an inherent security risk to your network, its use should be restricted.

Adding a security policy that encompasses a list of allowed secure sites will ensure that any HTTPS sites that are required are the only sites a student can go to.

FTP

For the most part, students should not be using FTP. FTP is not HTTP or HTTPS so you cannot use URL filtering to restrict where they go. This can be controlled with destination IPs in the security policy. With a policy that specifically outlines which FTP addresses are allowed, all other will be blocked.

Example security policies

Given these requirements, an example set of security policies could look like the following illustration. In a large setup, all the IPs for the students are treated by one of these four policies.

Simple security policy setup

<input type="checkbox"/>	Seq. No.	ID	Source	Destination	Schedule	Service	Action	Status
<input type="checkbox"/>	1	2	Student PCs	Allowed Websites	always	HTTPS	✓	✓
<input type="checkbox"/>	2	3	Student PCs	all	always	HTTP	✓	✓
<input type="checkbox"/>	3	4	Student PCs	Allowed DNS	always	DNS	✓	✓
<input type="checkbox"/>	4	5	Student PCs	Allowed FTP	always	FTP	✓	✓
<input type="checkbox"/>	5		all	all	always	ANY	✗	Implicit

The last policy in the list, included by default, is a deny policy. This adds to the potential of error that could end up allowing unwanted traffic to pass. The deny policy ensures that any traffic making it to this point is stopped. It can also help in further troubleshooting by viewing the logs for denied traffic.

With these policies in place, even before packet inspection occurs, the FortiGate, and the network are fairly secure. Should any of the UTM profiles fail, there is still a basic level of security.

UTM security profiles

AntiVirus profiles

Antivirus screening should be enabled for any service you have enabled in the security policies. In the case above, HTTP, FTP, as well as POP3 and SMTP (assuming there is email access for students). There is not a virus scan option for HTTPS, because the content is encrypted. Generally speaking, most of the network traffic will be students surfing the web.

To configure antivirus profiles in the web-based manager, go to **Security Profiles > AntiVirus**, or use the CLI commands under `config antivirus profile`.

Web filtering

The actual filtering of URLs, sites and content, should be performed by FortiGuard. It is easier for the network administrator. Web sites are constantly being monitored, and new ones reviewed and added to the FortiGuard databases every day. The FortiGuard categories provide an extensive list of offensive and non-productive sites.

As well, there are additional settings to include in a web filtering profile to best contain a student's web browsing.

- Web URL filtering should be enabled to set up exemptions for web sites that are blocked or reasons other than category filtering. It also prevents the use of IP addresses to get around web filtering.

- Block invalid URLs - HTTPS only. This option inspects the HTTPS certificate and looks at the URL to ensure it's valid. It is common for proxy sites to create an HTTPS certificate with a garbage URL. If the site is legitimate, it should be set up correctly. If the site approach to security is to ignore it, then their security policy puts your network at risk and the site should be blocked.
- Enable **Block malicious URLs discovered by FortiSandbox**. If the FortiSandbox discovers a threat, the source URL will be added to the list of URLs to be blocked by the FortiGate.

Web filtering options are configured in the GUI by going to **Security Profiles > Web Filter**, or in the CLI under `config webfilter profile`.

Categories and Classifications

For the selection of what FortiGuard categories and classifications that should be blocked, that is purely based on the school system and its Internet information policy.

Email Filtering

Other than specific teacher-led email inboxes, there is no reason why a student should be able to access, read or send personal email. Ports for POP3, SMTP and IMAP should not be opened in a security policies.

IPS

The intrusion protection profiles should be used to ensure the student PCs are not vulnerable to attacks, nor do you want students making attacks. As well, IPS can do more than simple vulnerability scans. With a FortiGuard subscription, IPS signatures are pushed to the FortiGate unit. New signatures are released constantly for various intrusions as they are discovered.

FortiOS includes a number of predefined IPS sensors that you can enable by default. Selecting the `all_default` signature is a good place to start as it includes the major signatures.

To configure IPS sensors in the GUI, go to **Security Profiles > Intrusion Protection**, on the CLI use commands under `config ips sensor`.

Application control

Application control uses IPS signatures to limit the use of instant messaging and peer-to-peer applications which can lead to possible infections on a student's PC. FortiOS includes a number of pre-defined application categories. To configure and maintain application control profiles in the GUI, go to **Security Profiles > Application Control**. In the CLI use commands under `config application list`.

Some applications to consider include proxies, botnets, toolbars and P2P applications.

Logging

Turn on all logging. Every option in this section should be enabled. This is not where you decide what you are going to log. It is simply defining what the UTM profiles can log.

Logging everything is a way to monitor traffic on the network, see what student's are utilizing the most, and locate any potential holes in your security plan. As well, keeping this information may help to prove negligence later in necessary.

PPTP and L2TP

A virtual private network (VPN) is a way to use a public network, such as the Internet, as a vehicle to provide remote offices or individual users with secure access to private networks. FortiOS supports the Point-to-Point Tunneling Protocol (PPTP), which enables interoperability between FortiGate units and Windows or Linux PPTP clients. Because FortiGate units support industry standard PPTP VPN technologies, you can configure a PPTP VPN between a FortiGate unit and most third-party PPTP VPN peers.

This section describes how to configure PPTP and L2TP VPNs as well as PPTP passthrough.

This section includes the topics:

- [How PPTP VPNs work](#)
- [FortiGate unit as a PPTP server](#)
- [Configuring the FortiGate unit for PPTP VPN](#)
- [Configuring the FortiGate unit for PPTP pass through](#)
- [Testing PPTP VPN connections](#)
- [Logging VPN events](#)
- [Configuring L2TP VPNs](#)
- [L2TP configuration overview](#)

How PPTP VPNs work

The Point-to-Point Tunneling Protocol enables you to create a VPN between a remote client and your internal network. Because it is a Microsoft Windows standard, PPTP does not require third-party software on the client computer. As long as the ISP supports PPTP on its servers, you can create a secure connection by making relatively simple configuration changes to the client computer and the FortiGate unit.

PPTP uses Point-to-Point protocol (PPP) authentication protocols so that standard PPP software can operate on tunneled PPP links. PPTP packages data in PPP packets and then encapsulates the PPP packets within IP packets for transmission through a VPN tunnel.

When the FortiGate unit acts as a PPTP server, a PPTP session and tunnel is created as soon as the PPTP client connects to the FortiGate unit. More than one PPTP session can be supported on the same tunnel. FortiGate units support PAP, CHAP, and plain text authentication. PPTP clients are authenticated as members of a user group.

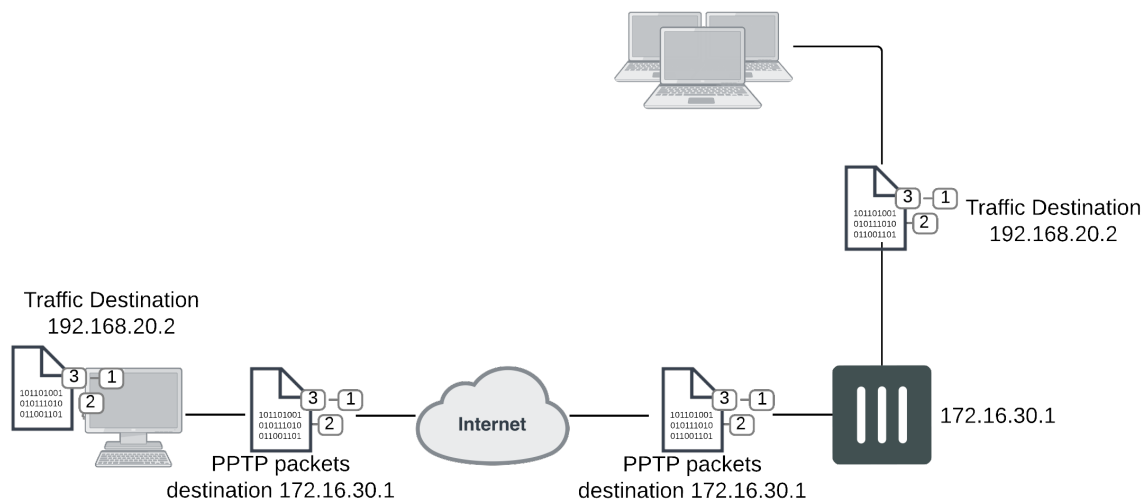
Traffic from one PPTP peer is encrypted using PPP before it is encapsulated using Generic Routing Encapsulation (GRE) and routed to the other PPTP peer through an ISP network. PPP packets from the remote client are addressed to a computer on the private network behind the FortiGate unit. PPTP packets from the remote client are addressed to the public interface of the FortiGate unit. See the figure below.



PPTP control channel messages are not authenticated, and their integrity is not protected. Furthermore, encapsulated PPP packets are not cryptographically protected and may be read or modified unless appropriate encryption software such as Secure Shell (SSH) or Secure File Transfer Protocol (SFTP) is used to transfer data after the tunnel has been established.

As an alternative, you can use encryption software such as Microsoft Point-to-Point Encryption (MPPE) to secure the channel. MPPE is built into Microsoft Windows clients and can be installed on Linux clients. FortiGate units support MPPE.

Packet encapsulation



Shown above, traffic from the remote client is addressed to a computer on the network behind the FortiGate unit. When the PPTP tunnel is established, packets from the remote client are encapsulated and addressed to the FortiGate unit. The FortiGate unit forwards disassembled packets to the computer on the internal network.

When the remote PPTP client connects, the FortiGate unit assigns an IP address from a reserved range of IP addresses to the client PPTP interface. The PPTP client uses the assigned IP address as its source address for the duration of the connection.

When the FortiGate unit receives a PPTP packet, the unit disassembles the PPTP packet and forwards the packet to the correct computer on the internal network. The security policy and protection profiles on the FortiGate unit ensure that inbound traffic is screened and processed securely.

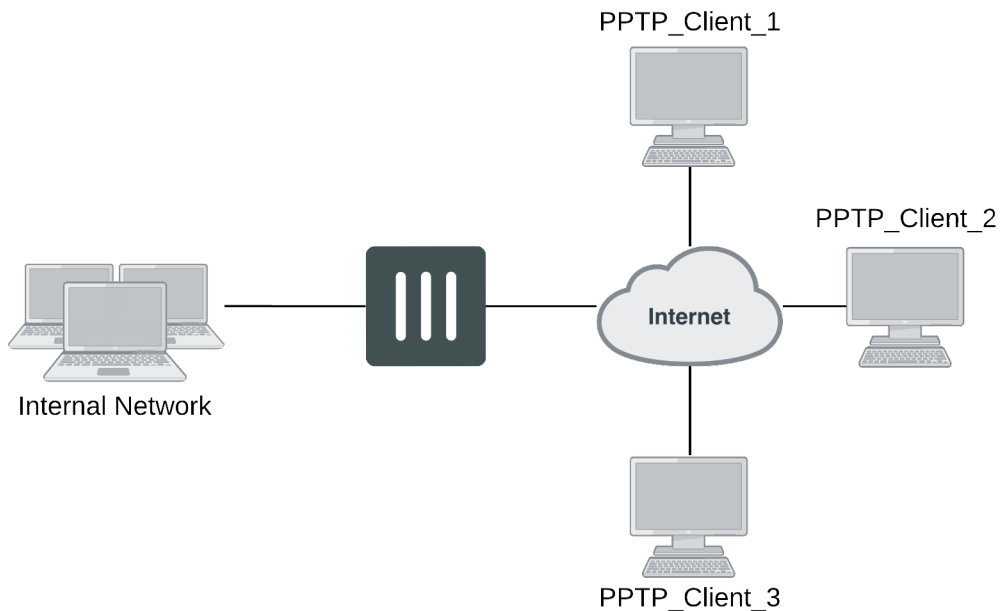


PPTP clients must be authenticated before a tunnel is established. The authentication process relies on FortiGate user group definitions, which can optionally use established authentication mechanisms such as RADIUS or LDAP to authenticate PPTP clients. All PPTP clients are challenged when a connection attempt is made.

FortiGate unit as a PPTP server

In the most common Internet scenario, the PPTP client connects to an ISP that offers PPP connections with dynamically-assigned IP addresses. The ISP forwards PPTP packets to the Internet, where they are routed to the FortiGate unit.

FortiGate unit as a PPTP server



If the FortiGate unit will act as a PPTP server, there are a number of steps to complete:

- Configure user authentication for PPTP clients.
- Enable PPTP.
- Specify the range of addresses that are assigned to PPTP clients when connecting
- Configure the security policy.

Configuring user authentication for PPTP clients

To enable authentication for PPTP clients, you must create user accounts and a user group to identify the PPTP clients that need access to the network behind the FortiGate unit. Within the user group, you must add a user for each PPTP client.

You can choose to use a plain text password for authentication or forward authentication requests to an external RADIUS, LDAP, or TACACS+ server. If password protection will be provided through a RADIUS, LDAP, or TACACS+ server, you must configure the FortiGate unit to forward authentication requests to the authentication server.

This example creates a basic user/password combination.

Configuring a user account

To add a local user - GUI

1. Go to **User & Device > User Definition** and select **Create New**.
2. Select **Local User**
3. Enter a **User Name**.
4. Enter a **Password** for the user. The password should be at least six characters.
5. Select **OK**.

To add a local user - CLI

```
config user local
  edit <username>
    set type password
    set passwd <password>
  end
```

Configuring a user group

To ease configuration, create user groups that contain users in similar categories or departments.

To create a user group - GUI

1. Go to **User & Device > User Group** and select **Create New**.
2. Enter a **Name** for the group.
3. Select the **Type** of **Firewall**.
4. From the **Available Users** list, select the required users and select the right-facing arrow to add them to the **Members** list.
5. Select **OK**.

To create a user group - CLI

```
config user group
  edit <group_name>
    set group-type firewall
    set member <user_names>
  end
```

Enabling PPTP and specifying the PPTP IP address range

The PPTP address range specifies the range of addresses reserved for remote PPTP clients. When a PPTP client connects to the FortiGate unit, the client is assigned an IP address from this range. Afterward, the FortiGate unit uses the assigned address to communicate with the PPTP client.

The address range that you reserve can be associated with private or routable IP addresses. If you specify a private address range that matches a network behind the FortiGate unit, the assigned address will make the PPTP client appear to be part of the internal network.

PPTP requires two IP addresses, one for each end of the tunnel. The PPTP address range is the range of addresses reserved for remote PPTP clients. When the remote PPTP client establishes a connection, the FortiGate unit assigns an IP address from the reserved range of IP addresses to the client PPTP interface or

retrieves the assigned IP address from the PPTP user group. If you use the PPTP user group, you must also define the FortiGate end of the tunnel by entering the IP address of the unit in **Local IP** (web-based manager) **or** `local-ip` (CLI). The PPTP client uses the assigned IP address as its source address for the duration of the connection.

PPTP configuration is only available through the CLI. In the example below, PPTP is enabled with the use of an IP range of 192.168.1.1 to 192.168.1.10 for addressing and the user group is `hr_staff`.



FortiOS 5.4.0 and later versions allow the start and end IPs in the PPTP address range to be in the same 16-bit subnet. Earlier versions require that the start and end IPs in the PPTP address range be in the same 24-bit subnet, for example, 192.168.1.1 - 192.168.1.254. .

```
config vpn pptp
  set status enable
  set ip-mode range
  set eip 192.168.1.10
  set sip 192.168.1.1
  set usrgrp hr_staff
end
```

In this example, PPTP is enabled with the use of a user group for addressing, where the IP address of the PPTP server is 192.168.1.2 and the user group is `hr_admin`.

```
config vpn pptp
  set status enable
  set ip-mode range
  set local-ip 192.168.2.1
  set usrgrp hr_admin
end
```

Adding the security policy

The security policy specifies the source and destination addresses that can generate traffic inside the PPTP tunnel and defines the scope of services permitted through the tunnel. If a selection of services are required, define a service group.

To configure the firewall for the PPTP tunnel - GUI

1. Go to **Policy & Objects > IPv4** or **Policy & Objects > IPv6** and select **Create New**.
2. Complete the following and select **OK**:

Incoming Interface	The FortiGate interface connected to the Internet.
Source Address	Select the name that corresponds to the range of addresses that you reserved for PPTP clients.
Outgoing Interface	The FortiGate interface connected to the internal network.
Destination Address	Select the name that corresponds to the IP addresses behind the FortiGate unit.

Schedule	always
Service	ALL
Action	ACCEPT

To configure the firewall for the PPTP tunnel - CLI

```
config firewall policy or config firewall policy6
edit 1
    set srcintf <interface to internet>
    set dstintf <interface to internal network>
    set srcaddr <reserved_range>
    set dstaddr <internal_addresses>
    set action accept
    set schedule always
    set service ALL
end
```

Configuring the FortiGate unit for PPTP VPN

To arrange for PPTP packets to pass through the FortiGate unit to an external PPTP server, perform the following tasks in the order given:

- Configure user authentication for PPTP clients.
- Enable PPTP on the FortiGate unit and specify the range of addresses that can be assigned to PPTP clients when they connect.
- Configure PPTP pass through on the FortiGate unit.

Configuring the FortiGate unit for PPTP passthrough

To forward PPTP packets to a PPTP server on the network behind the FortiGate unit, you need to perform the following configuration tasks on the FortiGate unit:

- Define a virtual IP address that points to the PPTP server.
- Create a security policy that allows incoming PPTP packets to pass through to the PPTP server.



The address range is the external (public) ip address range which requires access to the internal PPTP server through the FortiGate virtual port-forwarding firewall.

IP addresses used in this document are fictional and follow the technical documentation guidelines specific to Fortinet. Real external IP addresses are not used.

Configuring a virtual IP address

The virtual IP address will be the address of the PPTP server host.

To define a virtual IP for PPTP passthrough - GUI

1. Go to **Policy & Objects > Virtual IPs**.
2. Select **Create New**.
3. Choose the **VIP Type**.
4. Enter the name of the VIP, for example, `PPTP_Server`.
5. Select the **External Interface** where the packets will be received for the PPTP server.
6. Enter the **External IP Address** for the VIP.
7. Select **Port Forwarding**.
8. Set the **Protocol to TCP**.
9. Enter the **External Service Port** of 1723, the default for PPTP.
10. Enter the **Map to Port** to 1723.
11. Select **OK**.

To define a virtual IP for PPTP passthrough - CLI

```
config firewall vip or config firewall vip6
  edit PPTP_Server
    set extintf <interface>
    set extip <ip_address>
    set portforward enable
    set protocol tcp
    set extport 1723
    set mappedport 1723
    set mappedip <destination IP address range>
  end
```

You can also use `config firewall vip46` to define a virtual IP from an IPv4 address to an IPv6 address or `config firewall vip64` to define a virtual IP from an IPv6 address to an IPv4 address.

Configuring a port-forwarding security policy

To create a port-forwarding security policy for PPTP passthrough you must first create an address range reserved for the PPTP clients.

To create an address range - GUI

1. Go to **Policy & Objects > Addresses** and select **Create New**.
2. Select a **Category**.
3. Enter a **Name** for the range, for example, `External_PPTP`.
4. Select a **Type** of **Subnet/IP Range**.
5. Enter the IP address range.
6. Select the **Interface** to the Internet.
7. Select **OK**.

To create an address range - CLI

```
config firewall address OR config firewall address6
  edit External_PPTP
    set type ip_range
```

```

    set start-ip <ip_address>
    set end-ip <ip_address>
    set associated-interface <internet_interface>
end

```

With the address set, you can add the security policy.

To add the security policy - GUI

1. Go to **Policy & Objects > IPv4** or **Policy & Objects > IPv6** and select **Create New**.
2. Complete the following and select **OK**:

Incoming Interface	The FortiGate interface connected to the Internet.
Source Address	Select the address range created in the previous step.
Outgoing Interface	The FortiGate interface connected to the PPTP server.
Destination Address	Select the VIP address created in the previous steps.
Schedule	always
Service	PPTP
Action	ACCEPT

To add the security policy - CLI

```

config firewall policy or config firewall policy6
  edit <policy_number>
    set srcintf <interface to internet>
    set dstintf <interface to PPTP server>
    set srcaddr <address_range>
    set dstaddr <PPTP_server_address>
    set action accept
    set schedule always
    set service PPTP
  end

```

Testing PPTP VPN connections

To confirm that a PPTP VPN between a local network and a dialup client has been configured correctly, at the dialup client, issue a ping command to test the connection to the local network. The PPTP VPN tunnel initializes when the dialup client attempts to connect.

Logging VPN events

PPTP VPN, activity is logged when enabling VPN logging. The FortiGate unit connection events and tunnel status (up/down) are logged.

To log VPN events

1. Go to **Log & Report > Log Settings**.
2. Enable **Event Logging**.
3. Select **VPN activity event**.
4. Select **Apply**.

To view event logs

1. Go to **Log & Report > VPN Events**.
2. If the option is available to set the log location list, select disk or memory.
3. Select a log event and select **Details**.

Configuring L2TP VPNs

This section describes how to configure a FortiGate unit to establish a Layer Two Tunneling Protocol (L2TP) tunnel with a remote dialup client. The FortiGate implementation of L2TP enables a remote dialup client to establish an L2TP tunnel with the FortiGate unit directly.

According to RFC 2661, an Access Concentrator (LAC) can establish an L2TP tunnel with an L2TP Network Server (LNS). In a typical scenario, the LAC is managed by an ISP and located on the ISP premises; the LNS is the gateway to a private network. When a remote dialup client connects to the Internet through the ISP, the ISP uses a local database to establish the identity of the caller and determine whether the caller needs access to an LNS through an L2TP tunnel. If the services registered to the caller indicate that an L2TP connection to the LNS is required, the ISP LAC attempts to establish an L2TP tunnel with the LNS.

A FortiGate unit can be configured to act as an LNS. The FortiGate implementation of L2TP enables a remote dialup client to establish an L2TP tunnel with the FortiGate unit directly, bypassing any LAC managed by an ISP. The ISP must configure its network access server to forward L2TP traffic from the remote client to the FortiGate unit directly whenever the remote client requires an L2TP connection to the FortiGate unit.

When the FortiGate unit acts as an LNS, an L2TP session and tunnel is created as soon as the remote client connects to the FortiGate unit. The FortiGate unit assigns an IP address to the client from a reserved range of IP addresses. The remote client uses the assigned IP address as its source address for the duration of the connection.

More than one L2TP session can be supported on the same tunnel. FortiGate units can be configured to authenticate remote clients using a plain text user name and password, or authentication can be forwarded to an external RADIUS or LDAP server. L2TP clients are authenticated as members of a user group.

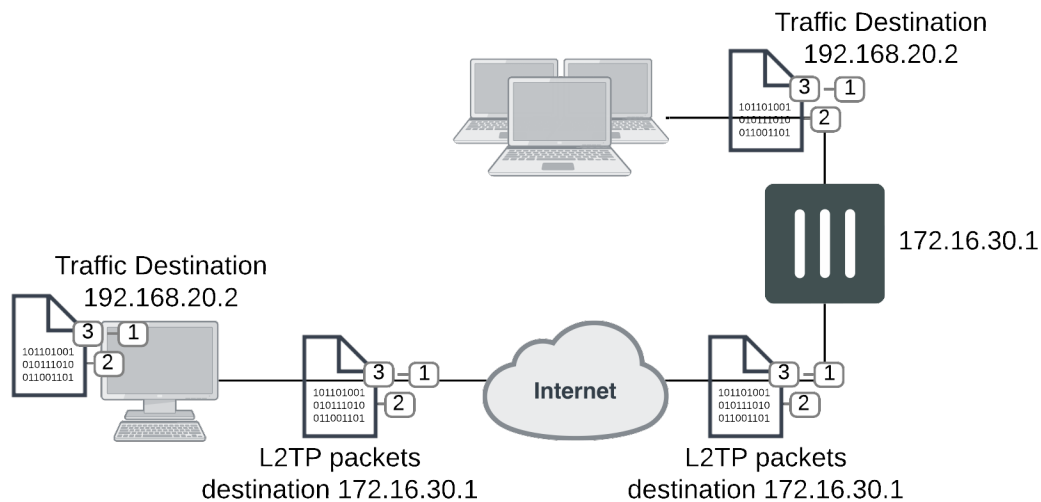


For site-to-site connections, Windows servers use IPsec encryption when you configure the VPN to connect to an L2TP server.

Traffic from the remote client must be encrypted using IPsec before it is encapsulated and routed to the FortiGate unit. Packets originating at the remote client are addressed to a computer on the private network behind the FortiGate unit. Encapsulated packets are addressed to the public interface of the FortiGate unit. See the figure below.

When the FortiGate unit receives an L2TP packet, the unit disassembles the packet and forwards the packet to the correct computer on the internal network. The security policy and protection profiles on the FortiGate unit ensure that inbound traffic is screened and processed securely.

L2TP encapsulation

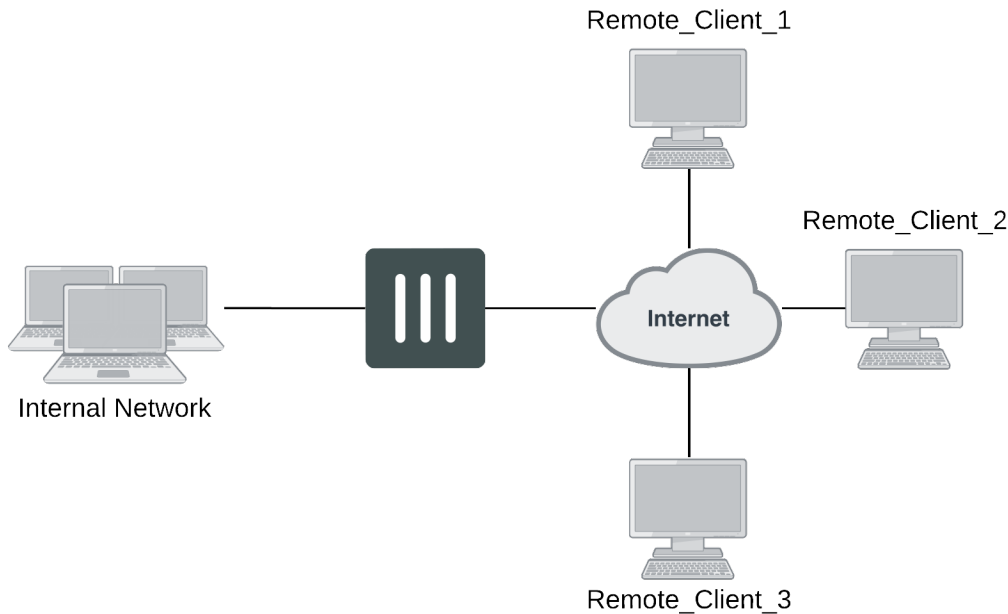


FortiGate units cannot deliver non-IP traffic such as Frame Relay or ATM frames encapsulated in L2TP packets — FortiGate units support the IPv4 and IPv6 addressing schemes only

Network topology

The remote client connects to an ISP that determines whether the client requires an L2TP connection to the FortiGate unit. If an L2TP connection is required, the connection request is forwarded to the FortiGate unit directly.

Example L2TP configuration



L2TP infrastructure requirements

- The FortiGate unit must be operating in NAT mode and have a static public IP address.
- The ISP must configure its network access server to forward L2TP traffic from remote clients to the FortiGate unit directly.
- The remote client must not generate non-IP traffic (Frame Relay or ATM frames).

L2TP configuration overview

To configure a FortiGate unit to act as an LNS, you perform the following tasks:

- Create an L2TP user group containing one user for each remote client.
- Enable L2TP on the FortiGate unit and specify the range of addresses that can be assigned to remote clients when they connect.
- Define firewall source and destination addresses to indicate where packets transported through the L2TP tunnel will originate and be delivered.
- Create the security policy and define the scope of permitted services between the source and destination addresses.
- Configure the remote clients.

Authenticating L2TP clients

L2TP clients must be authenticated before a tunnel is established. The authentication process relies on FortiGate user group definitions, which can optionally use established authentication mechanisms such as RADIUS or LDAP to authenticate L2TP clients. All L2TP clients are challenged when a connection attempt is made.

To enable authentication, you must create user accounts and a user group to identify the L2TP clients that need access to the network behind the FortiGate unit.

You can choose to use a plain text password for authentication or forward authentication requests to an external RADIUS or LDAP server. If password protection will be provided through a RADIUS or LDAP server, you must configure the FortiGate unit to forward authentication requests to the authentication server.

Enabling L2TP and specifying an address range

The L2TP address range specifies the range of addresses reserved for remote clients. When a remote client connects to the FortiGate unit, the client is assigned an IP address from this range. Afterward, the FortiGate unit uses the assigned address to communicate with the remote client.

The address range that you reserve can be associated with private or routable IP addresses. If you specify a private address range that matches a network behind the FortiGate unit, the assigned address will make the remote client appear to be part of the internal network.

To enable L2TP and specify the L2TP address range, use the `config vpn l2tp` CLI command.

The following example shows how to enable L2TP and set the L2TP address range using a starting address of 192.168.10.80 and an ending address of 192.168.10.100 for an existing group of L2TP users named L2TP_users:

```
config vpn l2tp
  set sip 192.168.10.80
  set eip 192.168.10.100
  set status enable
  set usrgroup L2TP_users
end
```

Defining firewall source and destination addresses

Before you define the security policy, you must define the source and destination addresses of packets that are to be transported through the L2TP tunnel:

- For the source address, enter the range of addresses that you reserved for remote L2TP clients (for example 192.168.10.[80-100]).
- For the destination address, enter the IP addresses of the computers that the L2TP clients need to access on the private network behind the FortiGate unit (for example, 172.16.5.0/24 for a subnet, or 172.16.5.1 for a server or host, or 192.168.10.[10-15] for an IP address range).

To define the firewall source address

1. Go to **Policy & Objects > Addresses** and select **Create New**.
2. Select **Address**.
3. In the **Name** field, type a name that represents the range of addresses that you reserved for remote clients (for example, Ext_L2TPrange).

4. In **Type**, select **IP Range**.
5. In the **Subnet / IP Range** field, type the corresponding IP address range.
6. In **Interface**, select the FortiGate interface that connects to the clients.
7. This is usually the interface that connects to the Internet.
8. Select **OK**.

To define the firewall destination address

1. Go to **Policy & Objects > Addresses** and select **Create New**.
2. In the **Address Name** field, type a name that represents a range of IP addresses on the network behind the FortiGate unit (for example, `Int_L2TPaccess`).
3. In **Type**, select **IP Range**.
4. In the **IP Range** field, type the corresponding IP address range.
5. In **Interface**, select the FortiGate interface that connects to the network behind the FortiGate unit.
6. Select **OK**.

Adding the security policy

The security policy specifies the source and destination addresses that can generate traffic inside the L2TP tunnel and defines the scope of services permitted through the tunnel. If a selection of services are required, define a service group.

To define the traffic and services permitted inside the L2TP tunnel

1. Go to **Policy & Objects > IPv4** or **Policy & Objects > IPv6** and select **Create New**.
2. Enter these settings:

Name	Input a name for the policy.
Incoming Interface	Select the FortiGate interface to the Internet.
Outgoing Interface	Select the FortiGate interface to the internal (private) network.
Source Address	Select the name that corresponds to the address range that reserved for L2TP clients (for example, <code>Ext_L2TPrange</code>).
Destination Address	Select the name that corresponds to the IP addresses behind the FortiGate unit (for example, <code>Int_L2TPaccess</code>).
Schedule	Select ALWAYS, or if a select schedule is required instead, select a schedule that you defined previously.
Service	Select ALL, or if selected services are required instead, select the service group that you defined previously.
Action	ACCEPT

3. Select **OK**.

Configuring a Linux client

This procedure outlines how to install L2TP client software and run an L2TP tunnel on a Linux computer. Obtain an L2TP client package that meets your requirements (for example, `rp-l2tp`). If needed to encrypt traffic, obtain L2TP client software that supports encryption using IPsec.

To establish an L2TP tunnel with a FortiGate unit that has been set up to accept L2TP connections, you can obtain and install the client software following these guidelines:

1. If encryption is required, you will need to verify the IPsec configuration.
2. Download and install the L2TP client package.
3. Configure an L2TP connection to run the L2TP program.
4. Configure routes to determine whether all or some of your network traffic will be sent through the tunnel. You must define a route to the remote network over the L2TP link and a host route to the FortiGate unit.
5. Run `l2tpd` to start the tunnel.

Follow the software supplier's documentation to complete the steps.

To configure the system, you need to know the public IP address of the FortiGate unit, and the user name and password that has been set up on the FortiGate unit to authenticate L2TP clients. Contact the FortiGate administrator if required to obtain this information.

Monitoring L2TP sessions

You can display a list of all active sessions and view activity by port number. By default, port 1701 is used for L2TP VPN-related communications. If required, active sessions can be stopped from this view. Use **FortiView > All Sessions**.

Testing L2TP VPN connections

To confirm that a VPN between a local network and a dialup client has been configured correctly, at the dialup client, issue a ping command to test the connection to the local network. The VPN tunnel initializes when the dialup client attempts to connect.

Logging L2TP VPN events

You can configure the FortiGate unit to log VPN events. For L2TP VPNs, connection events and tunnel status (up/down) are logged.

To log VPN events - GUI

1. Go to **Log & Report > Log Settings**.
2. Enable the storage of log messages to one or more locations.
3. Select **Enable**, and then select **VPN activity event**.
4. Select **Apply**.

To log VPN events - CLI

```
config log memory setting
  set diskfull overwrite
  set status enable
```



```
end
config log eventfilter
    set vpn enable
end
```

Session helpers

The FortiOS firewall can analyze most TCP/IP protocol traffic by comparing packet header information to security policies. This comparison determines whether to accept or deny the packet and the session that the packet belongs to.

Some protocols include information in the packet body (or payload) that must be analyzed to successfully process sessions for this protocol. For example, the SIP VoIP protocol uses TCP control packets with a standard destination port to set up SIP calls. But the packets that carry the actual conversation can use a variety of UDP protocols with a variety of source and destination port numbers. The information about the protocols and port numbers used for a SIP call is contained in the body of the SIP TCP control packets. To successfully process SIP VoIP calls, FortiOS must be able to extract information from the body of the SIP packet and use this information to allow the voice-carrying packets through the firewall.

FortiOS uses session helpers to analyze the data in the packet bodies of some protocols and adjust the firewall to allow those protocols to send packets through the firewall.

This section includes the topics:

- [Viewing the session helper configuration](#)
- [Changing the session helper configuration](#)
- [DCE-RPC session helper \(dcerpc\)](#)
- [DNS session helpers \(dns-tcp and dns-udp\)](#)
- [File transfer protocol \(FTP\) session helper \(ftp\)](#)
- [H.245 session helpers \(h245I and h245O\)](#)
- [H.323 and RAS session helpers \(h323 and ras\)](#)
- [Media Gateway Controller Protocol \(MGCP\) session helper \(mgcp\)](#)
- [ONC-RPC portmapper session helper \(pmap\)](#)
- [PPTP session helper for PPTP traffic \(pptp\)](#)
- [Remote shell session helper \(rsh\)](#)
- [Real-Time Streaming Protocol \(RTSP\) session helper \(rtsp\)](#)
- [Session Initiation Protocol \(SIP\) session helper \(sip\)](#)
- [Trivial File Transfer Protocol \(TFTP\) session helper \(tftp\)](#)
- [Oracle TNS listener session helper \(tns\)](#)

Viewing the session helper configuration

You can view the session helpers enabled on your FortiGate unit in the CLI using the commands below. The following output shows the first two session helpers. The number of session helpers can vary to around 20.

```
show system session-helper
config system session-helper
edit 1
```

```
set name pptp
set port 1723
set protocol 6
next
set name h323
set port 1720
set protocol 6
end
.
```

The configuration for each session helper includes the name of the session helper and the port and protocol number on which the session helper listens for sessions. Session helpers listed on protocol number 6 (TCP) or 17 (UDP). For a complete list of protocol numbers see [Assigned Internet Protocol Numbers](#).

For example, the output above shows that FortiOS listens for PPTP packets on TCP port 1723 and H.323 packets on port TCP port 1720.

If a session helper listens on more than one port or protocol the more than one entry for the session helper appears in the `config system session-helper` list. For example, the `pmap` session helper appears twice because it listens on TCP port 111 and UDP port 111. The `rsh` session helper appears twice because it listens on TCP ports 514 and 512.

Changing the session helper configuration

Normally you will not need to change the configuration of the session helpers. However in some cases you may need to change the protocol or port the session helper listens on.

Changing the protocol or port that a session helper listens on

Most session helpers are configured to listen for their sessions on the port and protocol that they typically use. If your FortiGate unit receives sessions that should be handled by a session helper on a non-standard port or protocol you can use the following procedure to change the port and protocol used by a session helper. The following example shows how to change the port that the `pmap` session helper listens on for Sun RPC portmapper TCP sessions. By default `pmap` listens on TCP port 111.

To change the port that the `pmap` session helper listens on to TCP port 112

1. Confirm that the TCP `pmap` session helper entry is 11 in the session-helper list:

```
show system session-helper 11
config system session-helper
edit 11
set name pmap
set port 111
set protocol 6
next
end
```

2. Enter the following command to change the TCP port to 112.

```
config system session-helper
edit 11
set port 112
```

```
end
```

3. The pmap session helper also listens on UDP port 111. Confirm that the UDP pmap session helper entry is 12 in the session-helper list:

```
show system session-helper 12
config system session-helper
edit 12
    set name pmap
    set port 111
    set protocol 17
next
end
```

4. Enter the following command to change the UDP port to 112.

```
config system session-helper
edit 12
    set port 112
end
```

Use the following command to set the h323 session helper to listen for ports on the UDP protocol.

To change the protocol that the h323 session helper listens on

1. Confirm that the h323 session helper entry is 2 in the session-helper list:

```
show system session-helper 2
config system session-helper
edit 2
    set name h323
    set port 1720
    set protocol 6
next
end
```

2. Enter the following command to change the protocol to UDP.

```
config system session-helper
edit 2
    set protocol 17
end
```

If a session helper listens on more than one port or protocol, then multiple entries for the session helper must be added to the session helper list, one for each port and protocol combination. For example, the rtsp session helper listens on TCP ports 554, 7070, and 8554 so there are three rtsp entries in the session-helper list. If your FortiGate unit receives rtsp packets on a different TCP port (for example, 6677) you can use the following command to configure the rtsp session helper to listen on TCP port 6677.

To configure a session helper to listen on a new port and protocol

```
config system session-helper
edit 0
    set name rtsp
    set port 6677
    set protocol 6
end
```

Disabling a session helper

In some cases you may need to disable a session helper. Disabling a session helper just means removing it from the session-helper list so that the session helper is not listening on a port. You can completely disable a session helper by deleting all of its entries from the session helper list. If there are multiple entries for a session helper on the list you can delete one of the entries to prevent the session helper from listening on that port.

To disable the mgcp session helper from listening on UDP port 2427

1. Enter the following command to find the mgcp session helper entry that listens on UDP port 2427:

```
show system session-helper
.
.
.
edit 19
  set name mgcp
  set port 2427
  set protocol 17
next
.
.
.
```

2. Enter the following command to delete session-helper list entry number 19 to disable the mgcp session helper from listening on UDP port 2427:

```
config system session-helper
delete 19
```

By default the mgcp session helper listens on UDP ports 2427 and 2727. The previous procedure shows how to disable the mgcp protocol from listening on port 2427. The following procedure completely disables the mgcp session helper by also disabling it from listening on UDP port 2727.

To completely disable the mgcp session helper

1. Enter the following command to find the mgcp session helper entry that listens on UDP port 2727:

```
show system session-helper
.
.
.
edit 20
  set name mgcp
  set port 2727
  set protocol 17
next
.
.
.
```

2. Enter the following command to delete session-helper list entry number 20 to disable the mgcp session helper from listening on UDP port 2727:

```
config system session-helper
delete 20
```

DCE-RPC session helper (dcerpc)

Distributed Computing Environment Remote Procedure Call (DCE-RPC) provides a way for a program running on one host to call procedures in a program running on another host. DCE-RPC (also called MS RPC for Microsoft RPC) is similar to ONC-RPC. Because of the large number of RPC services, for example, MAPI, the transport address of an RPC service is dynamically negotiated based on the service program's universal unique identifier (UUID). The Endpoint Mapper (EPM) binding protocol in FortiOS maps the specific UUID to a transport address.

To accept DCE-RPC sessions you must add a security policy with service set to any or to the DEC-RPC pre-defined service (which listens on TCP and UDP ports 135). The dcerpc session helper also listens on TCP and UDP ports 135.

The session allows FortiOS to handle DCE-RPC dynamic transport address negotiation and to ensure UUID-based security policy enforcement. You can define a security policy to permit all RPC requests or to permit by specific UUID number.

In addition, because a TCP segment in a DCE-RPC stream might be fragmented, it might not include an intact RPC PDU. This fragmentation occurs in the RPC layer; so FortiOS does not support parsing fragmented packets.

DNS session helpers (dns-tcp and dns-udp)

FortiOS includes two DNS session helpers, dns-tcp, a session helper for DNS over TCP, and dns-udp, a session helper for DNS over UDP.

To accept DNS sessions you must add a security policy with service set to any or to the DNS pre-defined service (which listens on TCP and UDP ports 53). The dns-udp session helper also listens on UDP port 53. By default the dns-tcp session helper is disabled. If needed you can use the following command to enable the dns-tcp session helper to listen for DNS sessions on TCP port 53:

```
config system session-helper
  edit 0
    set name dns-tcp
    set port 53
    set protocol 6
  end
```

File transfer protocol (FTP) session helper (ftp)

The FTP session helper monitors PORT, PASV and 227 commands and NATs the IP addresses and port numbers in the body of the FTP packets and opens ports on the FortiGate unit as required.

To accept FTP sessions you must add a security policy with service set to any or to the FTP, FTP_Put, and FTP_GET pre-defined services (which all listen on TCP port 21).

H.245 session helpers (h245I and h245O)

H.245 is a control channel protocol used for H.323 and other similar communication sessions. H.245 sessions transmit non-telephone signals. H.245 sessions carry information needed for multimedia communication, such as encryption, flow control jitter management and others.

FortiOS includes two H.245 sessions helpers, h245I which is for H.245 call in and h245O which is for H.245 call out sessions. There is no standard port for H.245. By default the H.245 sessions helpers are disabled. You can enable them as you would any other session helper. When you enable them, you should specify the port and protocol on which the FortiGate unit receives H.245 sessions.

H.323 and RAS session helpers (h323 and ras)

The H.323 session helper supports secure H.323 voice over IP (VoIP) sessions between terminal endpoints such as IP phones and multimedia devices. In H.323 VoIP networks, gatekeeper devices manage call registration, admission, and call status for VoIP calls. The FortiOS h323 session helper supports gatekeepers installed on two different networks or on the same network.

To accept H.323 sessions you must add a security policy with service set to any or to the H323 pre-defined service (which listens on TCP port numbers 1720 and 1503 and on UDP port number 1719). The h323 session helper listens on TCP port 1720.

The ras session helper is used with the h323 session helper for H.323 Registration, Admission, and Status (RAS) services. The ras session helper listens on UDP port 1719.

Alternate H.323 gatekeepers

The h323 session helper supports using H.323 alternate gatekeepers. All the H.323 end points must register with a gatekeeper through the Registration, Admission, and Status (RAS) protocol before they make calls. During the registration process, the primary gatekeeper sends Gatekeeper Confirm (GCF) and Registration Confirm (RCF) messages to the H.323 end points that contain the list of available alternate gatekeepers.

The alternate gatekeeper provides redundancy and scalability for the H.323 end points. If the primary gatekeeper fails the H.323 end points that have registered with that gatekeeper are automatically registered with the alternate gatekeeper. To use the H.323 alternate gatekeeper, you need to configure security policies that allow H.323 end points to reach the alternate gatekeeper.

Media Gateway Controller Protocol (MGCP) session helper (mgcp)

The Media Gateway Control Protocol (MGCP) is a text-based application layer protocol used for VoIP call setup and control. MGCP uses a master-slave call control architecture in which the media gateway controller uses a call agent to maintain call control intelligence, while the media gateways perform the instructions of the call agent.

To accept MGCP sessions you must add a security policy with service set to any or to the MGCP predefined service (which listens on UDP port numbers 2427 and 2727). The h323 session helper also listens on UDP port numbers 2427 and 2727.

The MGCP session helper does the following:

- VoIP signaling payload inspection. The payload of the incoming VoIP signaling packet is inspected and malformed packets are blocked.
- Signaling packet body inspection. The payload of the incoming MGCP signaling packet is inspected according to RFC 3435. Malformed packets are blocked.
- Stateful processing of MGCP sessions. State machines are invoked to process the parsed information. Any out-of-state or out-of-transaction packet is identified and properly handled.
- MGCP Network Address Translation (NAT). Embedded IP addresses and ports in packet bodies is properly translated based on current routing information and network topology, and is replaced with the translated IP address and port number, if necessary.
- Manages pinholes for VoIP traffic. To keep the VoIP network secure, the IP address and port information used for media or signaling is identified by the session helper, and pinholes are dynamically created and closed during call setup.

ONC-RPC portmapper session helper (pmap)

Open Network Computing Remote Procedure Call (ONC-RPC) is a widely deployed remote procedure call system. Also called Sun RPC, ONC-RPC allows a program running on one host to call a program running on another. The transport address of an ONC-RPC service is dynamically negotiated based on the service's program number and version number. Several binding protocols are defined for mapping the RPC program number and version number to a transport address.

To accept ONC-RPC sessions you must add a security policy with service set to any or to the ONC-RPC pre-defined service (which listens on TCP and UDP port number 111). The RPC portmapper session helper (called pmap) handles the dynamic transport address negotiation mechanisms of ONC-RPC.

PPTP session helper for PPTP traffic (pptp)

The PPTP session help supports port address translation (PAT) for PPTP traffic. PPTP provides IP security at the Network Layer. PPTP consists of a control session and a data tunnel. The control session runs over TCP and helps in establishing and disconnecting the data tunnel. The data tunnel handles encapsulated Point-to-Point Protocol (PPP) packets carried over IP.

To accept PPTP sessions that pass through the FortiGate unit you must add a security policy with service set to any or to the PPTP pre-defined service (which listens on IP port 47 and TCP port 1723). The pptp session helper listens on TCP port 1723.

PPTP uses TCP port 1723 for control sessions and Generic Routing Encapsulation (GRE) (IP protocol 47) for tunneling the encapsulated PPP data. The GRE traffic carries no port number, making it difficult to distinguish between two clients with the same public IP address. PPTP uses the source IP address and the Call ID field in the GRE header to identify a tunnel. When multiple clients sharing the same IP address establish tunnels with the same PPTP server, they may get the same Call ID. The call ID value can be translated in both the control message and the data traffic, but only when the client is in a private network and the server is in a public network.

PPTP clients can either directly connect to the Internet or dial into a network access server to reach the Internet. A FortiGate unit that protects PPTP clients can translate the clients' private IP addresses to a pool of public IP addresses using NAT port translation (NAT-PT). Because the GRE traffic carries no port number for address

translation, the pptp session helper treats the Call ID field as a port number as a way of distinguishing multiple clients.

After the PPTP establishing a TCP connection with the PPTP server, the client sends a start control connection request message to establish a control connection. The server replies with a start control connection reply message. The client then sends a request to establish a call and sends an outgoing call request message. FortiOS assigns a Call ID (bytes 12-13 of the control message) that is unique to each PPTP tunnel. The server replies with an outgoing call reply message that carries its own Call ID in bytes 12-13 and the client's call ID in bytes 14-15. The pptp session helper parses the control connection messages for the Call ID to identify the call to which a specific PPP packet belongs. The session helper also identifies an outgoing call request message using the control message type field (bytes 8-9) with the value 7. When the session helper receives this message, it parses the control message for the call ID field (bytes 12-13). FortiOS translates the call ID so that it is unique across multiple calls from the same translated client IP. After receiving outgoing call response message, the session helper holds this message and opens a port that accepts GRE traffic that the PPTP server sends. An outgoing call request message contains the following parts:

- The protocol used for the outgoing call request message (usually GRE)
- Source IP address (PPTP server IP)
- Destination IP address (translated client IP)
- Destination port number (translated client call ID)

The session helper identifies an outgoing call reply message using the control message type field (bytes 8-9) with the value 8. The session helper parses these control messages for the call ID field (bytes 12-13) and the client's call ID (bytes 14-15). The session helper then uses the client's call ID value to find the mapping created for the other direction, and then opens a pinhole to accept the GRE traffic that the client sends.

An outgoing call reply message contains the following parts:

- Protocol used for the outgoing call reply message (usually GRE)
- Source IP address (PPTP client IP)
- Destination IP address (PPTP server IP)
- Destination port number (PPTP server Call ID)

Each port that the session opens creates a session for data traffic arriving in that direction. The session helper opens the following two data sessions for each tunnel:

- Traffic from the PPTP client to the server, using the server's call ID as the destination port
- Traffic from the PPTP server to the client, using the client's translated call ID as the destination port

The default timeout value of the control connection is 30 minutes. The session helper closes the pinhole when the data session exceeds the timeout value or is idle for an extended period.

Remote shell session helper (rsh)

Using the remote shell program (RSH), authenticated users can run shell commands on remote hosts. RSH sessions most often use TCP port 514. To accept RSH sessions you must add a security policy with service set to any or to the RSH pre-defined service (which listens on TCP port number 514).

FortiOS automatically invokes the rsh session helper to process all RSH sessions on TCP port 514. The rsh session helper opens ports required for the RSH service to operate through a FortiGate unit running NAT or transparent and supports port translation of RSH traffic.

Real-Time Streaming Protocol (RTSP) session helper (rtsp)

The Real-Time Streaming Protocol (RTSP) is an application layer protocol often used by SIP to control the delivery of multiple synchronized multimedia streams, for example, related audio and video streams. Although RTSP is capable of delivering the data streams itself it is usually used like a network remote control for multimedia servers. The protocol is intended for selecting delivery channels (like UDP, multicast UDP, and TCP) and for selecting a delivery mechanism based on the Real-Time Protocol (RTP). RTSP may also use the SIP Session Description Protocol (SDP) as a means of providing information to clients for aggregate control of a presentation consisting of streams from one or more servers, and non-aggregate control of a presentation consisting of multiple streams from a single server.

To accept RTSP sessions you must add a security policy with service set to any or to the RTSP pre-defined service (which listens on TCP ports 554, 770, and 8554 and on UDP port 554). The rtsp session helper listens on TCP ports 554, 770, and 8554.

The rtsp session help is required because RTSP uses dynamically assigned port numbers that are communicated in the packet body when end points establish a control connection. The session helper keeps track of the port numbers and opens pinholes as required. In Network Address Translation (NAT) mode, the session helper translates IP addresses and port numbers as necessary.

In a typical RTSP session the client starts the session (for example, when the user selects the Play button on a media player application) and establishes a TCP connection to the RTSP server on port 554. The client then sends an OPTIONS message to find out what audio and video features the server supports. The server responds to the OPTIONS message by specifying the name and version of the server, and a session identifier, for example, 24256-1.

The client then sends the DESCRIBE message with the URL of the actual media file the client wants to play. The server responds to the DESCRIBE message with a description of the media in the form of SDP code. The client then sends the SETUP message, which specifies the transport mechanisms acceptable to the client for streamed media, for example RTP/RTCP or RDT, and the ports on which it receives the media.

In a NAT configuration the rtsp session helper keeps track of these ports and addresses translates them as necessary. The server responds to the SETUP message and selects one of the transport protocols. When both client and server agree on a mechanism for media transport the client sends the PLAY message, and the server begins streaming the media.

Session Initiation Protocol (SIP) session helper (sip)

The sip session helper is described in the VoIP Solutions: SIP Guide.

Trivial File Transfer Protocol (TFTP) session helper (tftp)

To accept TFTP sessions you must add a security policy with service set to any or to the TFTP pre-defined service (which listens on UDP port number 69). The TFTP session helper also listens on UTP port number 69.

TFTP initiates transfers on UDP port 69, but the actual data transfer ports are selected by the server and client during initialization of the connection. The tftp session helper reads the transfer ports selected by the TFTP client

and server during negotiation and opens these ports on the firewall so that the TFTP data transfer can be completed. When the transfer is complete the tftp session helper closes the open ports.

Oracle TNS listener session helper (tns)

The Oracle Transparent Network Substrate (TNS) listener listens on port TCP port 1521 for network requests to be passed to a database instance. The Oracle TNS listener session helper (tns) listens for TNS sessions on TCP port 1521. TNS is a foundation technology built into the Oracle Net foundation layer and used by SQLNET.

Advanced concepts

This section provides configuration concepts and techniques to enhance your network security and includes the topics:

- [Single firewall vs. multiple virtual domains](#)
- [Modem](#)
- [FortiExtender](#)
- [Assigning IP address by MAC address](#)
- [IP addresses for self-originated traffic](#)
- [Disk](#)
- [CLI Scripts](#)
- [Rejecting PING requests](#)
- [Opening TCP 113](#)
- [Obfuscate HTTP responses](#)

You can also find a collection of practical articles on Fortinet's [Cookbook](#) site under [Resources > SysAdmin Notes](#).

Single firewall vs. multiple virtual domains

A typical FortiGate setup, with a small to mid-range appliance, enables you to include a number of subnets on your network using the available ports and switch interfaces. This can potentially provide a means of having three or more mini networks for the various groups in a company. Within this infrastructure, multiple network administrators have access to the FortiGate to maintain security policies.

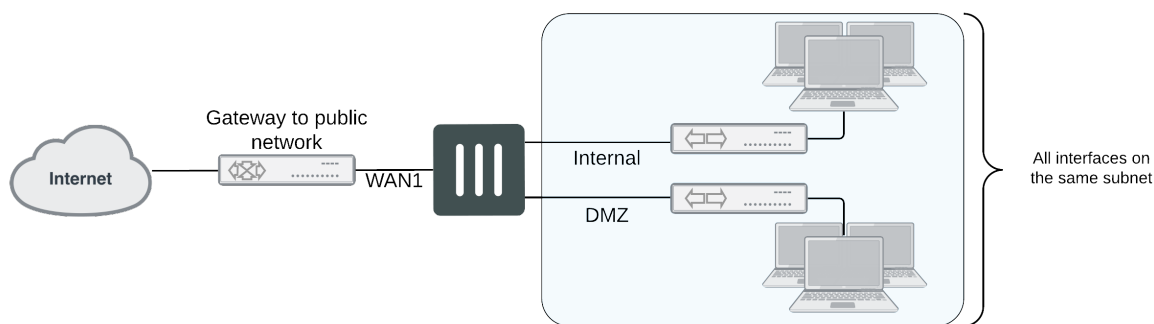
However, the FortiGate unit may not have enough interfaces to match the number of departments in the organization. If the FortiGate unit is running in transparent mode however, there is only one interface, and multiple network branches through the FortiGate are not possible.

A FortiGate unit with Virtual Domains (VDOMs) enabled, provides a means to provide the same functionality in transparent mode as a FortiGate in NAT mode. VDOMs are a method of dividing a FortiGate unit into two or more virtual units that function as multiple independent units. VDOMs can provide separate security policies and, in NAT mode, completely separate configurations for routing and VPN services for each connected network. For administration, an administrator can be assigned to each VDOM, minimizing the possibility of error or fouling network communications.

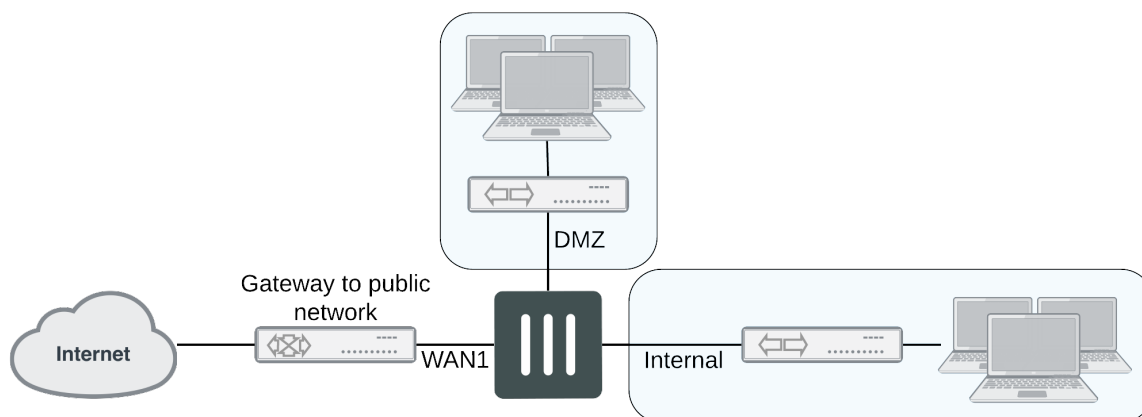
By default, most FortiGate units support 10 VDOMs. Many FortiGate models support purchasing a license key to increase the maximum number.

Single firewall vs. vdoms

When VDOMs are not enabled, and the FortiGate unit is in transparent mode, all the interfaces on your unit become broadcast interfaces. The problem is there are no interfaces free for additional network segments.



A FortiGate with three interfaces means only limited network segments are possible without purchasing more FortiGate devices.



With multiple VDOMs you can have one of them configured in transparent mode, and the rest in NAT mode. In this configuration, you have an available transparent mode FortiGate unit you can drop into your network for troubleshooting, and you also have the standard.

This example shows how to enable VDOMs on the FortiGate unit and the basic and create a VDOM accounting on the DMZ2 port and assign an administrator to maintain the VDOM. First enable Virtual Domains on the FortiGate unit.

To enable VDOMs - web-based manager

1. Go to **System > Dashboard > Status**.
2. In the **System Information** widget, select **Enable** for **Virtual Domain**.

Note that on FortiGate-60 series and lower models, you need to enable VDOMs in the CLI only.

The FortiGate unit logs you out. Once you log back in, you will notice that the menu structure has changed. This reflects the global settings for all Virtual Domains.

To enable VDOMs - CLI

```
config system global
    set vdom-admin enable
end
```

Next, add the VDOM called accounting.

To add a VDOM - web-based manager

1. Go to **Global > VDOM > VDOM**, and select **Create New**.
2. Enter the VDOM name `accounting`.
3. Select **OK**.

To add a VDOM - CLI

```
config vdom
    edit <new_vdom_name>
end
```

With the Virtual Domain created, you can assign a physical interface to it, and assign it an IP address.

To assign physical interface to the accounting Virtual Domain - web-based manager

1. Go to **Global > Network > Interface**.
2. Select the DMZ2 port row and select **Edit**.
3. For the **Virtual Domain** drop-down list, select **accounting**.
4. Select the **Addressing Mode** of **Manual**.
5. Enter the IP address for the port of 10.13.101.100/24.
6. Set the **Administrative Access** to **HTTPS** and **SSH**.
7. Select **OK**.

To assign physical interface to the accounting Virtual Domain - CLI

```
config global
    config system interface
        edit dmz2
            set vdom accounting
            set ip 10.13.101.100/24
            set allowaccess https ssh
        next
    end
```

Modem

FortiGate units support the use of wireless, 3G and 4G modems connected using the USB port or, if available, the express card slot. Modem access provides either primary or secondary (redundant) access to the Internet. For FortiGate units that do not include an internal modem (those units with an “M” designation), the modem interface will not appear in the web-based manager until enabled in the CLI. To enable the modem interface enter the CLI commands:

```
config system modem
    set status enable
end
```

You will need to log out of the FortiGate and log back in to see the modem configuration page at **Network > Modem**. Once enabled, modem options become available by going to **Network > Interfaces**.

Note that the modem interface is only available when the FortiGate unit is in NAT mode.

To configure modem settings, go to **> Network > Modem**.

Configuring the modem settings is a matter of entering the ISP phone number, user name and password. Depending on the modem, additional information may need to be supplied such as product identifiers, and initialization strings.

The FortiGate unit includes a number of common modems within its internal database. You can view these by selecting the **Configure Modem** link on the **Modem Settings** page. If your modem is not on the list, select **Create New** to add the information. This information is stored on the device, and will remain after a reboot.

Fortinet has an online database of modem models and configuration settings through FortiGuard. A subscription to the FortiGuard services is not required to access the information. As models are added, you can select the **Configure Modem** link and select **Update Now** to download new configurations.

USB modem port

Each USB modem has a specific dial-out port. This will be indicated with the documentation for your modem. To enable the correct USB port, use the CLI commands:

```
config system modem
    set wireless-port {0 | 1 | 2}
end
```

To test the port, use the diagnose command:

```
diagnose sys modem com /1
```

The 1 will be the value of your USB port selected. The response will be:

```
Serial port: /dev/l
Press Ctrl+W to exit.
```

If the port does not respond the output will be:

```
Can not open modem device '/dev/l' : Broken pipe
```

Modes

The FortiGate unit allows for two modes of operation for the modem; stand alone and redundant. In stand alone mode, the modem connects to a dialup ISP account to provide the connection to the Internet. In redundant mode, the modem acts as a backup method of connecting to the Internet, should the primary port for this function fails.

Configuring either stand alone or redundant modes are very similar. The primary difference is the selection of the interface that the modem will replace in the event of it failing, and the configuration of a PING server to monitor the chosen interface.

Configuring stand alone mode

Configuring stand alone mode is a matter of configuring the modem information and the dialing mode. The dial mode is either **Always Connect** or **Dial on demand**. Selecting **Always Connect** ensures that once the

modem has connected, it remains connected to the ISP. Selecting **Dial on Demand**, the modem only calls the ISP if packets are routed to the modem interface. Once sent, the modem will disconnect after a specified amount of time.

To configure standalone mode as needed - GUI

1. Go to **Network > Modem**.
2. Select the **Mode** of **Standalone**.
3. Select the **Dial Mode** of **Dial on Demand**.
4. Select the number of redials the modem attempts if connection fails to 5.
5. Select **Apply**.

To configure standalone mode as needed- CLI

```
config system modem
  set status enable
  set mode standalone
  set auto-dial enable
  set redial 5
end
```

Configuring redundant mode

Redundant mode provides a backup to an interface, typically to the Internet. If that interface fails or disconnects, the modem automatically dials the configured phone number(s). Once connected, the FortiGate unit routes all traffic to the modem interface until the monitored interface is up again. The FortiGate unit pings the connection to determine when it is back online.

For the FortiGate to verify when the interface is back up, you need to configure a Ping server for that interface. You will also need to configure security policies between the modem interface and the other interfaces of the FortiGate unit to ensure traffic flow.

To configure redundant mode as needed - GUI

1. Go to **Network > Modem**.
2. Select the **Mode** of **Redundant**.
3. Select the interface the modem takes over from if it fails.
4. Select the **Dial Mode** of **Dial on Demand**.
5. Select the number of redials the modem attempts if connection fails to 5.
6. Select **Apply**.

To configure standalone mode as needed- CLI

```
config system modem
  set status enable
  set mode redundant
  set interface wan1
  set auto-dial enable
  set redial 5
end
```


Link Health Monitor

Adding a link health monitor is required for routing fail over traffic. A link health monitor will confirm the connectivity of the device's interface

To add a link health monitor

```
config system link-monitor
  edit "Example1"
    set srcint <Interface_sending_probe>
    set server <ISP_IP_address>
    set protocol <Ping or http>
    set gateway-ip <the_gateway_IP_to_reach_the_server_if_required>
    set failtime <failure_count>
    set interval <seconds>
    set update-cascade-interface enable
    set update-static-route enable
    set status enable
  end
```

Additional modem configuration

The CLI provides additional configuration options when setting up the modem options including adding multiple ISP dialing and initialization options and routing. For more information, see the CLI Reference.

Modem interface routing

The modem interface can be used in FortiOS as a dedicated interface. Once enabled and configured, you can use it in security policies and define static and dynamic routing. Within the CLI commands for the modem, you can configure the distance and priority of routes involving the modem interface. The CLI commands are:

```
config system modem
  set distance <route_distance>
  set priority <priority_value>
end
```

For more information on the routing configuration in the CLI, see the CLI Reference. For more information on routing and configuring routing, see the Advanced Routing Guide.

Assigning IP address by MAC address

To prevent users from changing their IP addresses and causing IP address conflicts or unauthorized use of IP addresses, you can bind an IP address to a specific MAC address using DHCP.

Use the CLI to reserve an IP address for a particular client identified by its device MAC address and type of connection. The DHCP server then always assigns the reserved IP address to the client. The number of reserved addresses that you can define ranges from 10 to 200 depending on the FortiGate model.

After setting up a DHCP server on an interface by going to **Network > Interfaces**, select the blue arrow next to **Advanced** to expand the options. If you know the MAC address of the system select **Create New** to add it, or if the system has already connected, locate it in the list, select the check box and select **Add from DHCP Client List**.

You can also match an address to a MAC address in the CLI. In the example below, the IP address 10.10.10.55 for User1 is assigned to MAC address 00:09:0F:30:CA:4F.

```
config system dhcp reserved-address
  edit User1
    set ip 10.10.10.55
    set mac 00:09:0F:30:CA:4F
    set type regular
  end
```

IP addresses for self-originated traffic

On the FortiGate unit, there are a number of protocols and traffic that is specific to the internal workings of FortiOS. For many of these traffic sources, you can identify a specific port/IP address for this self-originating traffic. The following traffic can be configured to a specific port/IP address:

- SNMP
- Syslog
- alert email
- FortiManager connection IP
- FortiGuard services
- FortiAnalyzer logging
- NTP
- DNS
- Authorization requests such as RADIUS
- FSSO

Configuration of these services is performed in the CLI. In each instance, there is a command `set source-ip`. For example, to set the source IP of NTP to be on the DMZ1 port with an IP of 192.168.4.5, the commands are:

```
config system ntp
  set ntptsync enable
  set syncinterval 5
  set source-ip 192.168.4.5
end
```

To see which services are configured with source-ip settings, use the `get` command:

```
get system source-ip status
```

The output will appear similar to the sample below:

```
NTP: x.x.x.x
DNS: x.x.x.x
SNMP: x.x.x.x
Central Management: x.x.x.x
FortiGuard Updates (AV/IPS): x.x.x.x
FortiGuard Queries (WebFilter/SpamFilter): x.x.x.x
```

Disk

To view the status and storage information of the local disk on your FortiGate unit, go to **System > Advanced**. The **DiskSettings** menu appears only on FortiGate units with an internal hard or flash disk.

Formatting the disk

The internal disk of the FortiGate unit (if available) can be formatted by going to **System > Advanced** and selecting **Disk Settings**.

Formatting the disk will erase all data on it, including databases for antivirus and IPS; logs, quarantine files, and WAN optimization caches. The FortiGate unit requires a reboot once the disk has been formatted.

Setting space quotas

If the FortiGate unit has an internal hard or flash disk, you can allocate the space on the disk for specific logging and archiving, and WAN optimization. By default, the space is used on an as required basis. As such, a disk can fill up with basic disk logging, leaving less potential space for quarantine.

By going to **System > Advanced**, you can select the **Edit** icon for **Logging and Archiving** and **WAN Optimization & Web Cache** and define the amount of space each log, archive and WAN optimization has on the disk.

CLI Scripts

To upload bulk CLI commands and scripts, go to **System > Advanced**.

Scripts are text files containing CLI command sequences. Scripts can be used to deploy identical configurations to many devices. For example, if all of your devices use identical security policies, you can enter the commands required to create the security policies in a script, and then deploy the script to all the devices which should use those same settings.

Use a text editor such as Notepad or other application that creates simple text files. Enter the commands in sequence, with each line as one command, similar to examples throughout the FortiOS documentation set.

If you are using a FortiGate unit that is not remotely managed by a FortiManager unit or the FortiGuard Analysis and Management Service, the scripts you upload are executed and discarded. If you want to execute a script more than once, you must keep a copy on your management PC.

If your FortiGate unit is configured to use a FortiManager unit, you can upload your scripts to the FortiManager unit, and run them from any FortiGate unit configured to use the FortiManager unit. If you upload a script directly to a FortiGate unit, it is executed and discarded.

If your FortiGate unit is configured to use FortiGuard Analysis and Management Service, scripts you upload are executed and stored. You can run uploaded scripts from any FortiGate unit configured with your FortiGuard Analysis and Management Service account. The uploaded script files appear on the FortiGuard Analysis and Management Service portal web site.

Uploading script files

After you have created a script file, you can then upload it through **System > Advanced**. When a script is uploaded, it is automatically executed.

Commands that require the FortiGate unit to reboot when entered in the command line will also force a reboot if included in a script.

To execute a script

1. Go to **System > Advanced**.
2. Enable **Configuration Scripts**.
3. Select **Upload and Run a New Script** to locate the script file.
4. Select **Apply**.

If the FortiGate unit is not configured for remote management, or if it is configured to use a FortiManager unit, uploaded scripts are discarded after execution. Save script files to your management PC if you want to execute them again later.

If the FortiGate unit is configured to use the FortiGuard Analysis and Management Service, the script file is saved to the remote server for later reuse. You can view the script or run it from the FortiGuard Analysis and Management Service portal web site.

Auto repeat of CLI commands

Occasionally there is a need to repeatedly run a diagnose command over a long period of time (like checking CPU or memory usage, or checking proxy health). Previously, this could only be done with external console connections. With FortiOS 5.4.0, this can be done in a script using the `interval` and `repeat` commands.

Scripts can be uploaded as a file from the CLI or GUI. To upload scripts from the GUI go to **System > Advanced > Configuration Scripts** and upload and run the script.

To configure the schedule and scripts, use the following syntax:

```
config system auto-script
  edit <ScriptName>
    set interval
    set repeat
    set script
  end
end
```

`interval` the interval time in seconds between instances of the script running.

`repeat` the number of times to repeat the running of the script. The value 0 is used to set an infinite number of repetitions.

`start` `select manual` to start the script manually or `auto` to start the script automatically

`script` the contents of the script.

This feature may not be available on all models as a hard drive is necessary to make use of it.

Rejecting PING requests

The factory default configuration of your FortiGate unit allows the default external interface to respond to ping requests. Depending on the model of your FortiGate unit the actual name of this interface will vary. For the most secure operation, you should change the configuration of the external interface so that it does not respond to ping requests. Not responding to ping requests makes it more difficult for a potential attacker to detect your FortiGate unit from the Internet. One such potential threat are Denial of Service (DoS) attacks.

A FortiGate unit responds to ping requests if ping administrative access is enabled for that interface.

To disable ping administrative access - web-based manager

1. Go to **System > Network > Interface**.
2. Choose the external interface and select **Edit**.
3. Clear the **Ping Administrative Access** check box.
4. Select **OK**.

In the CLI, when setting the allowaccess settings, by selecting the access types and not including the PING option, that option is then not selected. In this example, only HTTPS is selected.

To disable ping administrative access - CLI

```
config system interface
  edit external
    set allowaccess https
  end
```

Opening TCP 113

Although seemingly contrary to conventional wisdom of closing ports from hackers, this port, which is used for ident requests, should be opened.

Port 113 initially was used as an authentication port, and later defined as an identification port (see RFC 1413). Some servers may still use this port to help in identifying users or other servers and establish a connection. Because port 113 receives a lot of unsolicited traffic, many routers, including on the FortiGate unit, close this port.

The issue arises in that unsolicited requests are stopped by the FortiGate unit, which will send a response saying that the port is closed. In doing so, it also lets the requesting server know there is a device at the given address, and thus announcing its presence. By enabling traffic on port 113, requests will travel to this port, and will most likely, be ignored and never responded to.

By default, the ident port is closed. To open it, use the following CLI commands:

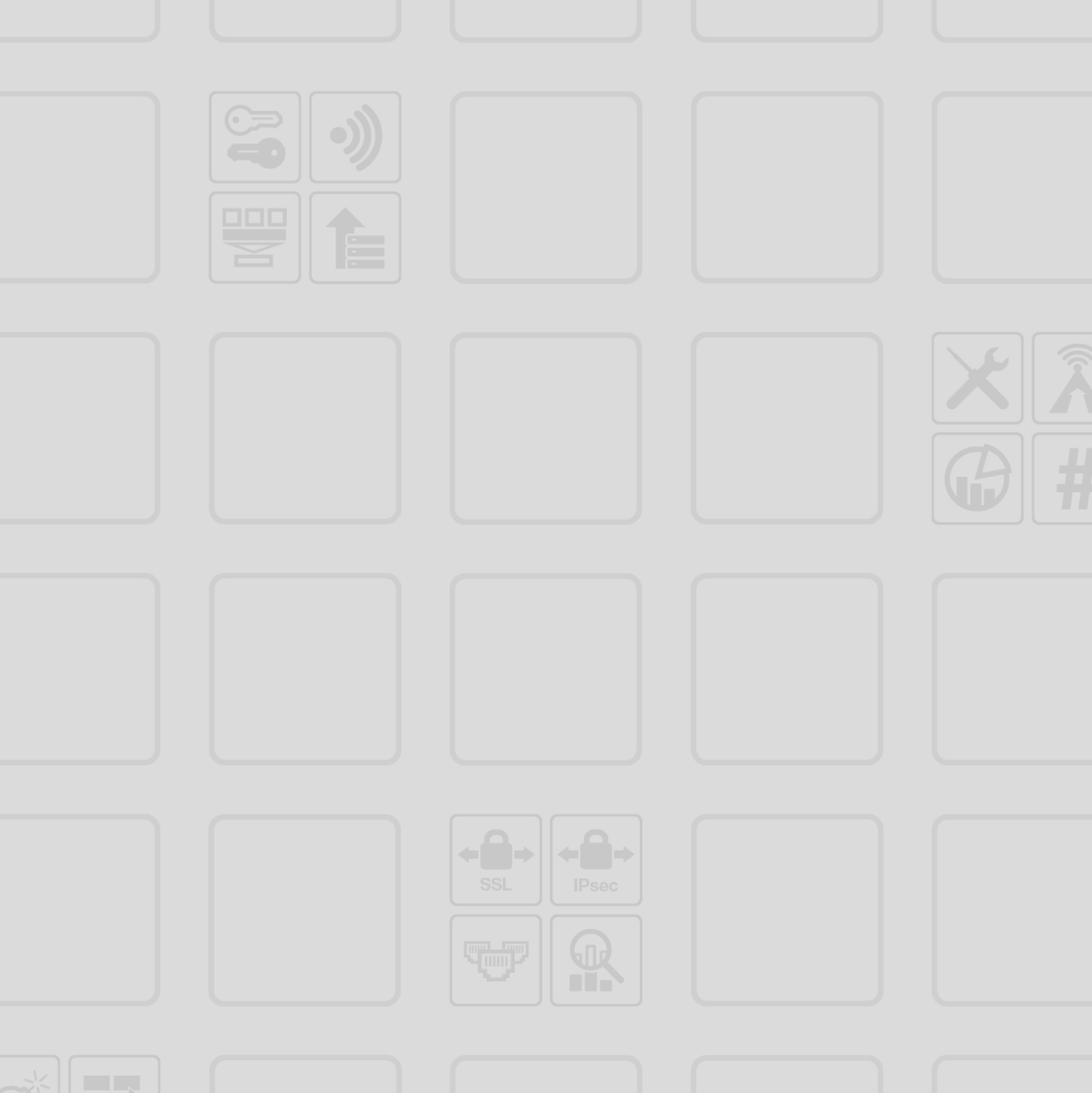
```
config system interface
  edit <port_name>
    set ident_accept enable
  end
```

You could also further use port forwarding to send the traffic to a non-existent IP address and thus never have a response packet sent.

Obfuscate HTTP responses

The FortiGate unit can obfuscate the HTTP responses from the FortiGate admin GUI and SSL VPN servers. By default this option is not enabled. To obfuscate HTTP headers, use the following CLI command:

```
config vpn ssl settings
  set url-obscurate {enable | disable}
```



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